

MODERN Machine Shop


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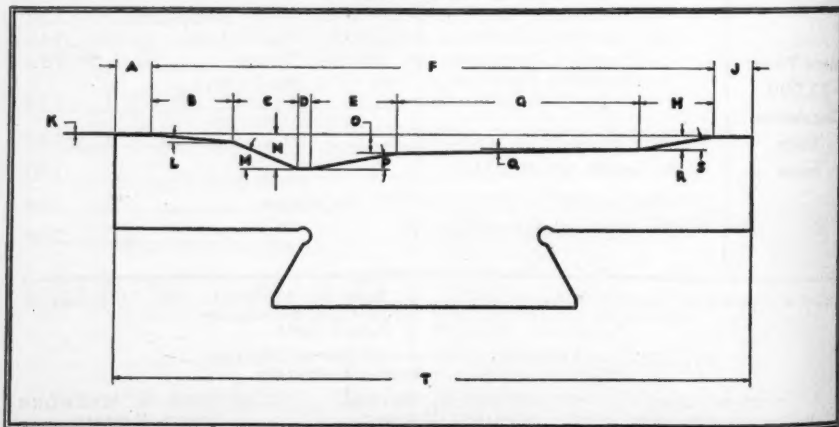
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CINCINNATI, OHIO

MARCH, 1937

VOL. 9, No. 10

Hydraulic Power and Its Applications to Modern Industry

BY WALTER L. TANN

Hydraulic Engineer, Farrel-Birmingham Company, Ansonia, Conn.

FLUIDS, under control, have been doing man's work for ages past. Fluids uncontrolled have been undoing man's work for ages past, as all who have witnessed the ravaging floods of last year and of this year will testify.

Yet the same principles that are at work when the Connecticut, Ohio or Mississippi rivers go on a rampage are utilized in a giant hydraulic press or a highly refined machine tool with hydraulic feed or speed control. In the rivers we have huge volumes of fluid bursting over their channels and through restraining dikes and levees, while in the case of man-made equipment we have infinitely smaller volumes at high pressures, endeavoring unsuccessfully to evade the "channels" and held in leash by the "dikes" and "levees" provided by the designers of the equipment.

One is the perfect example of fluids gone wild, on destruction bent, while the other is the well-nigh perfect example of fluids under control, performing useful work in this age of mechanism.

Broadly speaking, the subject of

Hydraulics deals with the laws governing the pressure and the flow of fluids and the application of these laws to engineering practice.

Use of Hydraulics by the Ancients

Hydraulics is a very old science and it is interesting to look behind the scenes of any art or science and endeavor to read the story of the pioneers, working through the years, until we come to the culmination of their efforts as we view them today.

In its earlier conceptions, the application of hydraulics had for its object the conveying of water along artificially constructed channels for irrigation and domestic purposes. These early applications of the flow of fluids date back to the dawn of Egyptian history, and we find the Egyptians constructing canals for transit purposes for use in their many wars as early as 3000 B. C. However, traces of hydraulic projects for the better utilization of the waters of the Nile have been found that antedate these canals by many years.

According to Josephus, "the gardens of Solomon were made beautiful by fountains and other water works."

Two thousand years ago the aqueducts of Rome were constructed and were among the wonders of the world. Even today the city of Athens is partially supplied with water by means of an aqueduct constructed several centuries before the Christian era.

Pascal's Law

But hydraulics as an art and science slumbered on until the end of the 17th century, when some philosophers, working on the design of fountains in Italian landscape gardens, were confronted with certain problems dealing with the flow of water under pressure. These philosophers, Torricelli, Mariotte and Bernoulli, made experiments to determine the discharge of water through orifices in the sides of tanks and through short pipes. Torricelli's famous theorem may be said to be the foundation of modern hydraulics.

But while these Italian savants had definitely proven by actual works that their theorems were more or less correct, a contemporary French scientist by the name of Pascal was evolving a theorem, or law, upon which the science of hydraulics is based. Pascal made the following statement: "If a vessel full of water, and closed on all sides, has two openings, the one a hundred times as large as the other, and if each be supplied with a piston that fits it exactly, then a man pushing the small piston will exert a force which will equilibrate that of one hundred men pushing the large piston, and will overcome that of ninety-nine."

Translating Pascal's 17th century writings into 20th century English, we can say that if we have one piston of one square inch area and place one pound on it, it will create sufficient pressure to balance another piston, connected to the same hydraulic sys-

tem, having an area of 40 square inches and carrying a weight of 40 lbs. Or, it would balance a piston of 100 square inch area weighing 100 lbs. The principle is that a force of one pound per square inch is transmitted in all directions.

Like many fundamental physical conceptions, there was a trick to this quaintly-phrased law of Pascal. Note that he said that the "pistons fit the opening exactly." It took over a hundred years before someone discovered how to make this exact "fit"

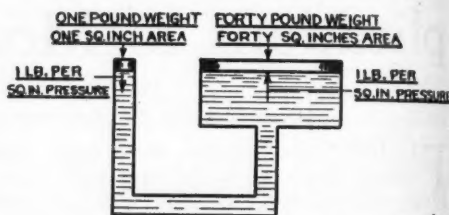


Fig. 1—Drawing illustrating Pascal's Law that hydraulic pressure is transmitted equally in all directions. The one-pound weight on an area of one square inch produces a hydraulic pressure of one pound per square inch in the system. Therefore, it is evident that on a ram or weight fitting a cylinder having an area of forty square inches the pressure of one pound per square inch will support this ram or weight weighing forty pounds.

and it was an Englishman named Joseph Brahmah who was responsible. In 1785 or 1786 he invented the cup packing that resulted in the immediate use of "Brahmah's hydraulic press," which consisted of a hand plunger pump piped to a large cylinder and ram.

By Pascal's fundamental law, 200 lbs. per square inch exerted on the small pump plunger exerted 200 lbs. per square inch on a large piston, making sizeable forces available for baling and similar tasks. Speed of press closure was slow, of course, due to the small displacement of the hand pump. Hand pump presses are still being built, but in the small sizes. Brahmah's invention became popular

at once in England, due to the large forces that could be obtained with it.

Mr. W. G. Armstrong, who later organized the original firm which has now grown into Vickers-Armstrong, Ltd., developed a hydraulic crane around 1845 and invented the hydraulic accumulator, which stores a large amount of fluid under an artificial head of pressure.

It was natural that these inventions of hydraulic machinery would find a ready acceptance in this period long previous to the development of electric power and the consequent use of the electric motor. Hydraulic power made available a fluid force, comparatively easily transmitted and utilized. So popular did this new industrial power become that sometime between 1850 and 1860 we find London and other large English cities piped for hydraulic power. Central pumping stations were built, and hydraulic pipe lines laid in much the same manner as the high-pressure fire lines in New York City and some other large centers. Thus we see the genesis of our present public utility corporations. These high pressure water lines are still existent, by the way, although their use is very limited today.

Hydraulics an Easy Means of Multiplying Force

Now that we have seen a little of the beginning of the hydraulic power that makes hydraulic machinery possible, let us turn our attention to the machinery itself. There are, however, certain premises upon which the use of hydraulic machinery must be predicated and it must be remembered that it is not a revolutionary cure-all.

Since the ancient days when man first used the lever and the wedge to move boulders or to split trees into firewood, his ability to develop and use machinery has been a story of continued progress. More than two hundred years before the Christian

era, that grand old Greek philosopher and scientist, Archimedes, upon his discovery of the law of levers, had caught the conception of the transmission of force when he said, "Give me a fulcrum and a lever that is long enough and I will lift the world!" The successful operation of all machinery, from the simplest forms to the most complicated, simply requires the means for the transmission and utilization of energy in such a way that useful

This article is the first of a series of three by a well-known hydraulic engineer dealing with the history, development, and modern applications of hydraulic power.

work may be done. Since we know that we can neither create nor destroy energy in this process, we can only use the machine as a means to transform a small force acting through a great distance to a great force acting through a small distance.

In many processes involved in industry we find extremely large forces necessary, and in a great number of cases we find the hydraulic principle the most convenient means of producing these forces. This is so because the power may be developed or generated at one point and transmitted to another point with but small loss. At the point of use, great forces or pressures may be produced with nothing more complicated than a cylinder and a ram or plunger. The pressure produced also has an inherent res-

ilience behind it, quite unlike the metal-to-metal contact of cam surfaces, or the progressive throw of a crankshaft. This resilience of hydraulic power is one of the reasons for a stir of interest in hydraulic power in some industries that had either never before utilized it, or had utilized it and discarded it before the pumping equipment and control systems now available had been developed.

Applications of Hydraulic Power

Hydraulic power is especially adapted to comparatively slow moving machinery with straight line or reciprocating motions, actuated by high pressure. Hydraulics, as yet, has found but small application in the field of highspeed machinery with low pressures, and, with but few exceptions, in the field of rotary motion. Of course we are not considering the field of hydro-electric power generation, nor similar branches of the art.

The prime fields for hydraulic applications are the compression or compacting of loose or plastic materials, the shearing, punching, forming, drawing and forging of metals, feed and speed control of metal-working tools, the moving of heavy weights, and special applications such as hydraulic lifts or elevators with enormous platforms, where variable speed is required or where structural conditions dictate the application of the hydraulic principle. All of these applications involve relatively slow movement, straight line motion, and heavy forces, produced without the intervention of gear trains, toggles or cranks. Notice that high speed rotary motion is not included. From the foregoing, we can recognize the limitations of hydraulic power, as well as its peculiar advantages.

The hydraulic press is the simplest of the applications of hydraulic power for industry, so we will first consider its use and general construction.

Hydraulic presses fall into three broad and general classifications. First, presses for use in the plastic industries, handling material such as rubber, composition flooring materials, inlaid linoleum, and that new and aggressive industry, "Plastic Molding", which produces molded products of such materials as Bakelite, Textolite, Micarta, Beetleware, Plastine, to mention only a few from over eight hundred different trade names. In mentioning these few names, it has been only with the object of seeking to have the process identified in a broad way.

The second classification of hydraulic presses applies to presses for metal working, which broadly speaking, includes shearing, punching, drawing and forming of metals. It is the latter field, particularly, that is exciting quite a bit of interest today.

The third group includes hydraulic forging presses, which will be separated from the above classification of metal working presses on account of the difference in application of hydraulic power as well as their enormous size as expressed in terms of tonnage applied to the work.

In conclusion, we shall consider the presses or applications of the cylinder and plunger principle in one fourth and last group which we will label "miscellaneous." This group will include dehydrating presses, baling presses, forcing presses, such as wheel presses, hydraulic elevators or lifts, hydraulic feeds, and so on.

That is quite a formidable list to examine in detail, especially when one considers that it covers the range from a small 5 or 10 ton capacity laboratory press, equipped with a hand pump, on up to an armor plate forging press of 15,000 tons capacity, and starting with a platen perhaps 8 or 10 inches square and ranging up to the hydraulic elevators at Radio City

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Music Hall in Rockefeller Center, New York City, where the entire stage and orchestra pit are raised and lowered on hydraulic plungers. These elevators are 70 feet long by 16 feet wide and have a total lift of 42 feet. But the principle back of every one of these

hydraulic press a reality, and it still is true that without a packing suitable for retaining the pressure exerted against the ram we could not have the hydraulic press nor hydraulic machinery in any of its various forms. Essentially, the hydraulic press consists of a cylinder in which is fitted a ram, or piston, that passes through a packing and a gland. To the ram is attached a platen, or bolster, which engages the work to be compressed, formed or punched. Opposite the moving platen is a fixed platen which is maintained at a fixed distance from the cylinder by means of tension rods or side frames.

In some designs of presses, depending upon the character of the work or operation, the ram and moving platen or bolster move upward, while in other designs they move down to engage the work. In presses used in the plastic industries, the more common practice is to have the ram move upward, while in the metal industries, the down-acting ram is used. It is obvious that the rising ram is the cheaper construction, because when its work stroke is finished and the operating valve opened to exhaust the cylinder, the ram will descend by force of gravity. In the type of ram that descends to the work, auxiliary cylinders are necessary to raise the ram to its original position when its work stroke has been completed.

These auxiliary cylinders may be of the so-called "push-back" type, which are single-acting rams, effective only during the return stroke of the main ram, or they may be of the "pull-back" type, consisting of double acting pistons, effective during both the working and return stroke of the press. The use of one type or the other is governed by the application of the press, the desired speed of operation and the functioning of the control system.

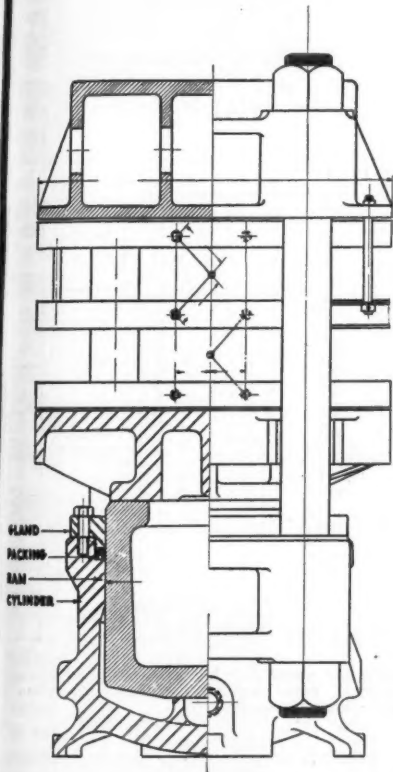


Fig. 2—Partial section through a hydraulic press of the type commonly used for molding rubber products. Pressure on the moving-up ram is supplied by a pump and accumulator system.

applications is the same that was expounded by M. Pascal away back in the 17th century.

We have read how Brahmah's invention of the cup packing made the

Hydraulic Press Design

The mechanical design of the hydraulic press consists principally of the following parts:

(1) The cylinder casting, which is sometimes integral with either the

deflection within proper limits.

(3) The moving crosshead or slide, which must also be designed to resist the same forces.

(4) The tie or tension rods. These must be of sufficiently large cross-

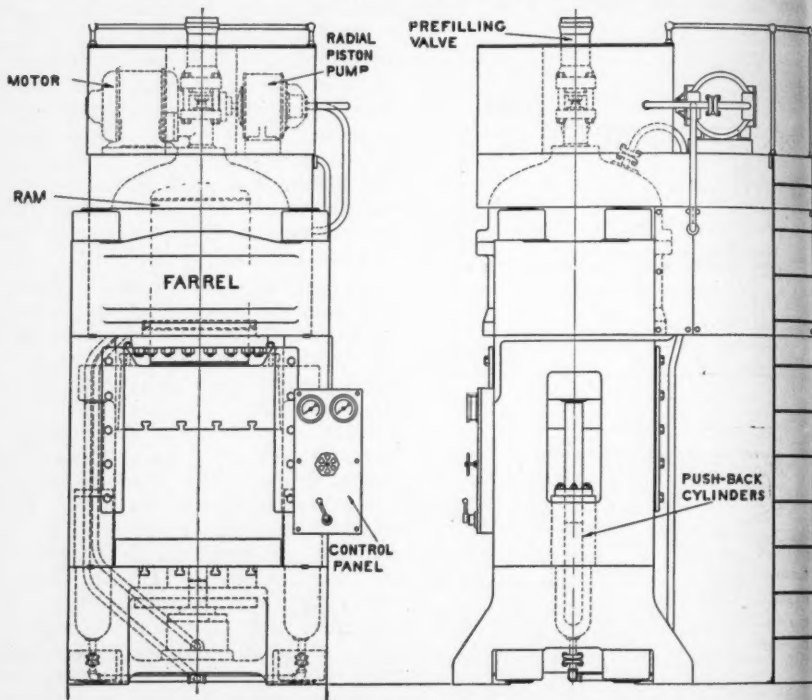


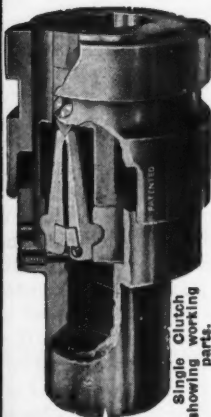
Fig. 3—Front and side elevations of a typical hydraulic metal forming press with self-contained pumping unit. This press is the moving-down type, with push-back cylinders to return the moving platen to the starting position.

top or bottom platen or crosshead, so that it will safely withstand the bursting stresses imposed upon it by the high hydraulic pressure, and, when integral with the platen or crosshead, keeping deflection within the limits imposed by the pressing operation to be performed on the press.

(2) The fixed platen, or crosshead, which must also be designed to withstand the bending imposed upon it by the action of the press, keeping its

section area to keep the tensile stress low enough to avoid appreciable stretch, which would throw the crossheads out of alignment. Eccentric loading on the press platens produces a couple or movement resulting in combined tension and bending on the tie rods, which combined forces may bring the total stress almost up to the elastic limit of the material. It is here that trouble begins. Therefore, due consideration must be given to the possi-

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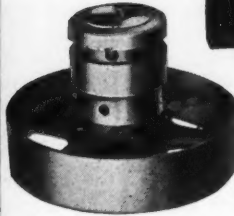


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bility of eccentric loading, but suffice to say that almost every metal working press will have eccentric loading to some degree and, therefore, the allowable stresses are kept low.

Ram Packings

The foregoing is a general description of the mechanics of the hydraulic press, fairly complete with but one exception, and that is the subject of packing. Packing is a controversial subject and no one type of packing material will suit all applications. The most common packing material is twisted or braided flax, hemp or cotton, impregnated with a lubricant and formed into the desired shapes. As this type of packing is made in strands, it can be cut to any required length. Packings of this type are comparatively inexpensive, and some kinds are good for high operating temperatures. They are not particularly desirable for high pressure service, nor where excessive frictional drag is objectionable.

One of the best packing materials for normal temperature service is leather. It has good wearing qualities and is able, in the proper form, to withstand high pressures. Due to the gelatine mass in oak-tanned leather, this type of leather packing is liable to become hard when used in temperatures above 150 degrees. Chrometanned leather is usually considered good for temperatures as high as 200 degrees.

Oak-tanned leather is usually not affected by fluid mediums used in hydraulic pressure systems, but chrometanned leather is sometimes decomposed by certain types of oils. The U-leather packings have given satisfactory service for pressures as high as 12,000 pounds per square inch. Higher pressures than this seldom occur in regular hydraulic service; in fact, this pressure is exceptional and is encountered most frequently with

steam or hydraulic intensifier systems where the high pressures are localized.

Other types of packings used in hydraulic work include the V-type, which may be of either leather or molded composition. When a double-acting ram is used, either for main ram service or for pull-backs, piston rings are often used in place of molded or leather packings.

A knowledge of the proper way to install new packings has a great bearing on their life. Carelessness in installation may so damage a packing, of whatever type, that its usefulness as a pressure seal is seriously impaired from the start. No other detail in the maintenance of hydraulic machinery is the cause of so much expense and annoyance as the packing.

Packing is also required for the hydraulic operating valves and is subject to the same remarks as the ram packing. Valve packing is not subject to deterioration from heat, as may be the case with ram packing when used on presses where heated platens are used, as in the plastic industries.

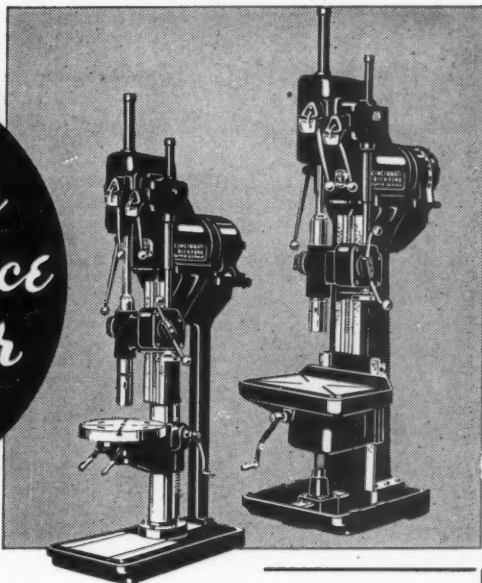
The Hydraulic Pressure Plant

The methods used for producing the hydraulic power, and for controlling it, vary with the particular application of the hydraulic press. For instance, the pressure plant necessary to serve a battery of rubber vulcanizing presses varies widely from the pumping equipment needed by a high speed metal-forming press. And the control system for the vulcanizing press is much simpler than the combined hydraulic, electric and pneumatic control used on the metal-forming press. After we look into the details of the various types of hydraulic presses, we will return to the subject of hydraulic power generation and control.

(The second article in this series will be published in the April issue of MODERN MACHINE SHOP.)

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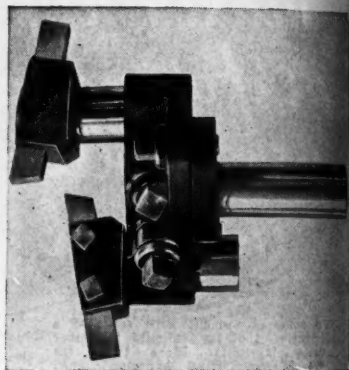
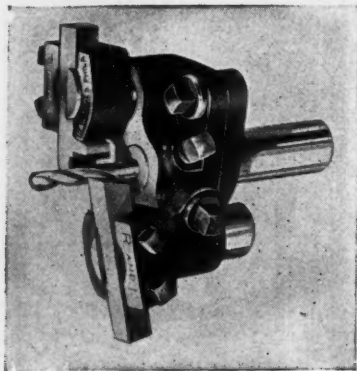
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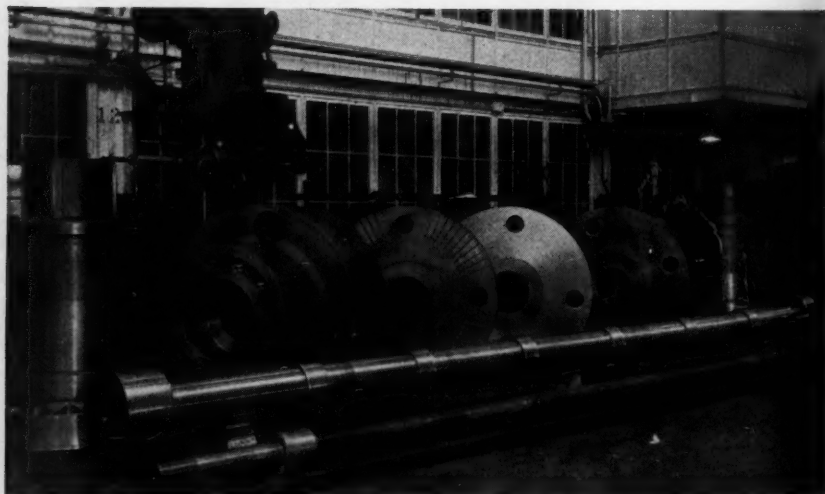
Engineer, Westinghouse Electric & Mfg. Company

MANUFACTURERS of heavy electrical machinery and equipment are constantly confronted with problems of "ways and means" arising from the constant increase in the size of the units that are being designed for modern generating plants. Equipment which a few years ago seemed entirely adequate for future requirements has been proven incapable of handling work of the size now demanded. The Westinghouse Electric & Manufacturing Company recently completed a 183,333 KVA turbine generator—the largest single shaft unit built up to date—which

comprises a very good example of the work that must be handled in these modern times and also illustrates the limitations of the equipment mentioned above.

The construction of the generator referred to requires some 59,000 pounds of copper for the stator and rotor. The complete rotor including the coils weighs 125 tons. With its rated speed of 1800 r.p.m., which is approximately the speed of an automobile engine at 45 miles an hour, its weight of 125 tons and the distance between bearings of 32 feet, the necessity for careful workman-

Fig. 1—Plates, 13-In. Diameter Center Bolt, and One of the Four-In. Bolts Used In the Construction of a Rotor for a 183,333 KVA Turbine Generator



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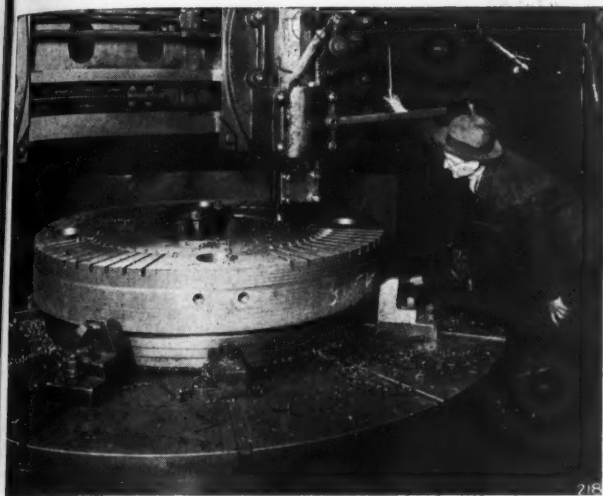


Fig. 2 — Machining the Plates for the Rotor

one 13-in. bolt directly through the center.

The plates, shown finished in Fig. 1, were machined to size and shape in the vertical boring mill shown in operation in Fig. 2, and all the holes were drilled, including the balance holes. However, 1/16 in. of stock was left on the diameters so

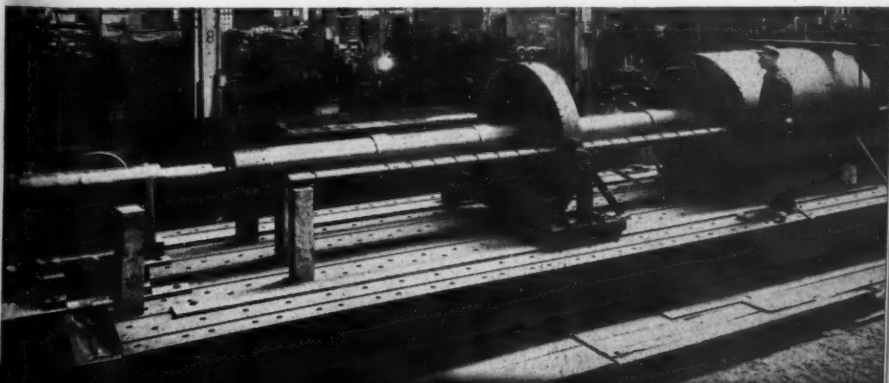
that the rotor could be finish-turned after the field had been wound and baked.

The journals, which are separate forgings, are secured to their respective end heads by twelve 4-in. bolts. All of these members were fitted together by means of spigot fits turned and bored in the various members to a fairly heavy press fit. Sufficient stock was left on the journals so that they could be finished in the last operation.

ship and precise balancing is quite evident.

Instead of a solid forging, from which the larger rotors are usually made, the rotor of this machine is of laminated construction. That is, the central portion is made up of a number of forged plates, finished to 8 in. thickness, assembled between two heavy forged end heads. The end heads and plates are held together by four 6-in. bolts evenly spaced around the circumference and

Fig. 3—Assembling the Plates. This job is being done on a planer table. The plates are carried in a four-wheel cradle and are pulled into place by a hydraulic "bolt stretcher."



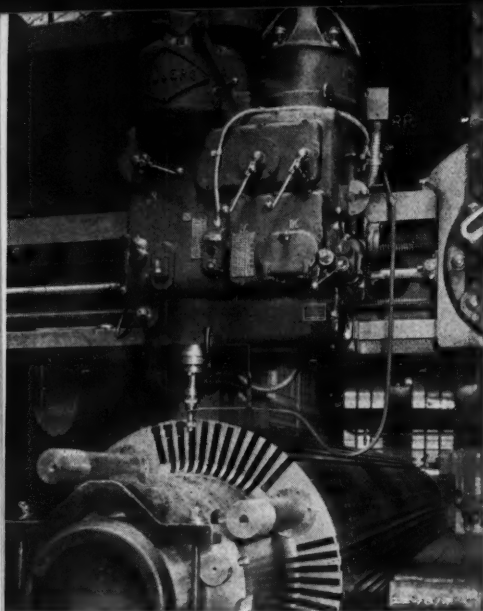


Fig. 4—Milling the Wedge Slots in the Assembled Rotor

Because of the weight of the parts and the subsequent difficulty of handling, it was decided to assemble the field on the planer upon which the greater portion of the machine work for the piece would be done. Accordingly, a 10-ft. planer, shown in Fig. 5, was selected for the purpose and was arranged as shown in Fig. 3. The head end, which can be seen back

was properly located and clamped securely in position. The center bolt being in place, a large lathe center was clamped to the platen so that the bolt could properly be aligned.

One of the major difficulties encountered developed from the fact that, in the assembling of the rotor, each one of the plates in turn had to be passed over the end of the central bolt and, at intervals, had to clear centering bushings which had been shrunk into place and finish ground in position. It was essential that these bushings be undisturbed during the assembly so that they would serve to hold the bolt in perfect alignment in service.

To facilitate the handling of the plates on the machine table, a carriage was made, equipped with four wheels and having a cradle which could be raised by the movement of two levers one of which can be seen pointing in the direction of the workman. Two flat strips of steel, bolted to the planer table, served as a track for the carriage wheels. As each plate was brought to the machine, the center bolt was blocked up, the lathe center was withdrawn, the plate was lowered into the cradle of the carriage, and the carriage was then positioned so that the end of the bolt could be inserted through center hole.

Fig. 5—View of the Complete Rotor In Position on the Planer Table

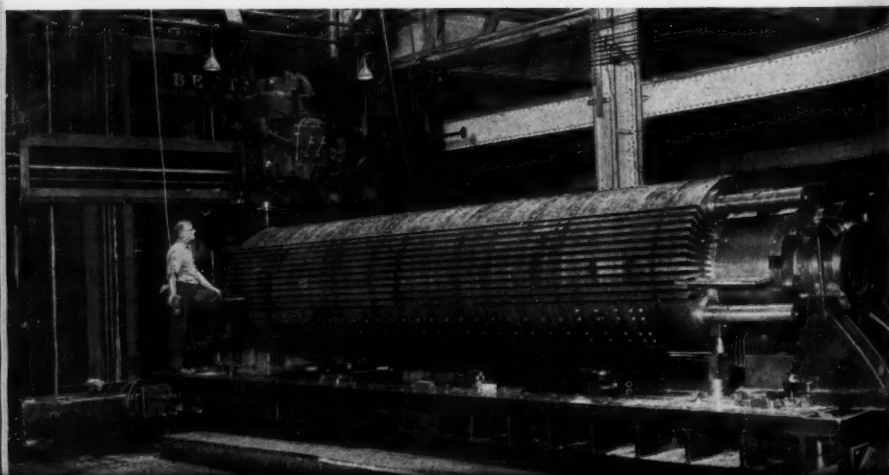




Fig. 1334

the Boss says
"They're Economical"

the Worker says
"They're Comfortable"

They're both right about

"HALLOWELL" STEEL STOOLS

These stools are more comfortable—they're designed that way, and as a result the worker becomes less fatigued and remains more efficient and productive. Too, the one-piece welded construction of "Hallowell" Stools makes them last longer.

It will pay you to investigate. Send for Bulletin 477.

"Hallowell" Steel Work Benches

Serviceable, outlasts wood; inexpensive; fireproof—and 1368 different sizes are carried in stock. Whatever your requirements there's a type and size that's **EXACTLY** what you want. **WRITE FOR BULLETIN.**



Pat'd and
Pats. Pending
FIG. 732



Fig. 1249



Fig. 1267

**Immediate
Delivery!**

STANDARD PRESSED STEEL Co.

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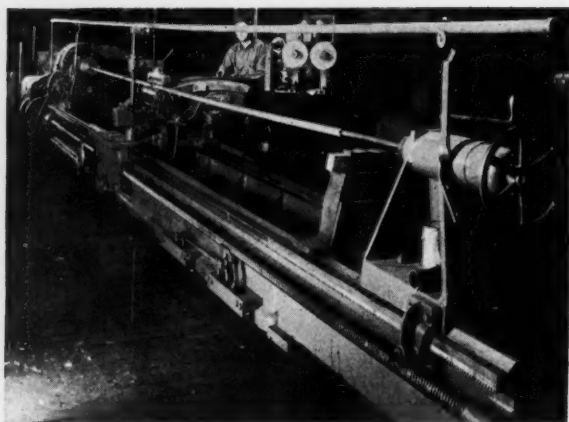


Fig. 6 — This insulation winding lathe had to be lengthened 8 ft. Note the joint in the side of the bed.

In order to make sure that the plates were assembled as tightly together as possible, a hydraulic bolt stretcher was located in position at the rear of the end head, with two pulling bolts, attached to the pulling rams of the stretcher, extending through the horizontal bolt holes in the head. One of these bolts, identified by the grooves which are spaced at regular intervals, can be seen extending through the plate shown in Fig. 3. With the plate in position for assembling and the pulling bolts extending through the bolt holes, horseshoe washers were slipped into the grooves behind the plate, the lathe center was properly located in the end of the center bolt, and

the plate was pulled "home".

With the rotor completely assembled, the 6-in. bolts regularly used were slipped into place, pulled two at a time to the proper tension, and the nuts run up to place. The center bolt was expanded by means of live steam, which was passed

through the center hole, and the large round nuts in the end heads tightened up. Temporary shaft ends were bolted in place and the rotor rested on vee-blocks at the ends for the planing operation on the wedge slots.

With the rotor completely assembled, the wedge slots are planed to the correct depth and width, then the

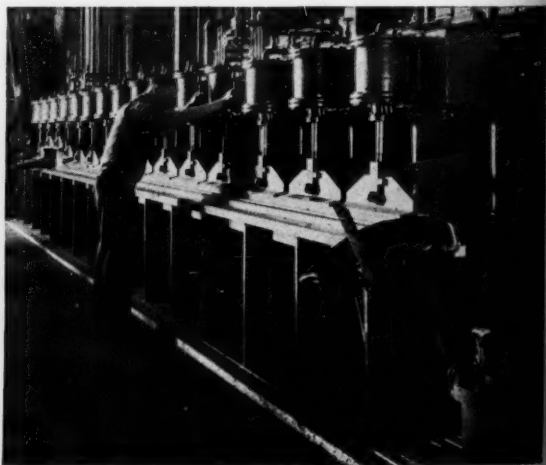


Fig. 7—Air-operated press for baking and pressing the stator coils. The press is of welded steel plate.

1937

LESS BREAKAGE

WELDON

DESIGNED TOOTH
END-MILL FORMATION

OLD STYLE

WELDON



THE WELDON TOOL CO.

321 FRANKFORT AVE.

C L E V E L A N D - - - O H I O

Four Points to Consider!

Weldon End-Mills Have—

1. Form-Milled Teeth—For uniform size of flutes, maximum strength.
2. Ample Chiproom—For rapid chip ejection, no clogging.
3. Strong End Teeth—Made possible by the cupped end.
4. Uniform Hardness—Thru careful metallurgical treatment.

The successful combination of these points means less breakage and outstanding performance.

We Can Prove It!



"Pioneers in Fast Spiral Double-end End Mills"

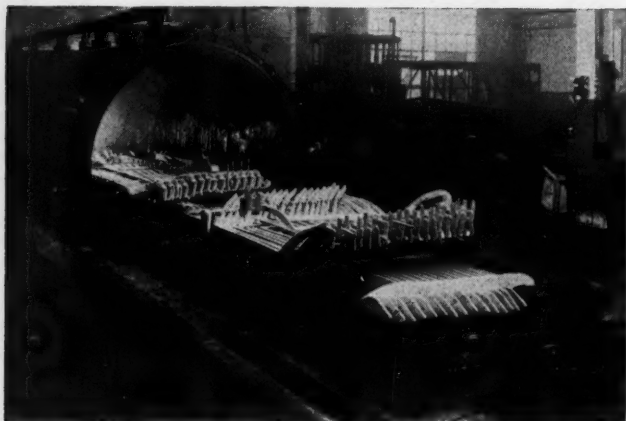


Fig. 8—Impregnating Tank for impregnating Stator Coils. This tank will take coils up to 36 feet in length.

milling head shown in Fig. 4 is pressed into service and the wedge slots are milled. Fig. 5 shows the complete rotor with the milling attachment on the planer in operation.

The field coils and mica were baked under pressure, in which operation it has been the practice in the past to supply pressure rings which encircle the rotor at intervals, with large setscrews registering with the slots to provide pressure. These rings, because of the high pressures used and the necessity of many pressure points, have proved a cumbersome and costly method of pressing.

On the job shown, a new method of pressing has been devised whereby grooved bars in short lengths are slipped into the wedge slots, the pressure being supplied by numerous smaller setscrews working in tapped holes in these bars. The setscrews are turned as tightly as possible with the aid of an air motor, the final tightening being done by hand. Rather than to build an oven of a size that would encompass this rotor, heat was provided to bake the coils by passing current through the coils themselves.

Aside from the special tools such as special reamers, drill jigs, fix-

ment as that described here often means changes in the permanent equipment. Brief mention will be made of several instances.

The stationary portion of the generator, because of its unusual size, was made in three pieces so that they could be shipped. Each part had the iron built into it at the power plant, separately, then the three pieces were aligned and bolted together with insulated bolts the overall length of which is 284 inches.

In order to provide the bolts with seamless insulation, it was found necessary to lengthen the insulation winding lathe as shown in Fig. 6. The bed and feed screw were lengthened approximately 8 ft. by joining to the original bed, which was of the customary cast construction, an extension fabricated from steel plate. The joint can be seen in the middle foreground of the illustration.

The coils for the stator were of such length that existing presses with hot plates for baking and pressing were too short; thus a press of greater capacity had to be provided. This press, shown in Fig. 7, was fabricated from plate and structural shapes, and is a very good example

(Continued on Page 87)



OVER 600 SIZES

JOHNSON GENERAL PURPOSE BRONZE BEARINGS

● Here is a complete bronze bearing service—as near as your telephone. The exact size you require—in any quantity. Machine finished, ready for assembly. Instantly available from representative stocks in every principal industrial center.

THE CORRECT ALLOY

S.A.E. 64—Copper 80; Tin 10; Lead 10 has been definitely proven to be the best bronze alloy for all general purpose applications. Johnson Bearings are cast in this alloy and give greater performance and longer Bearing life. Write for catalogue showing sizes and prices.

● Sold through Industrial Supply Distributors

JOHNSON BRONZE

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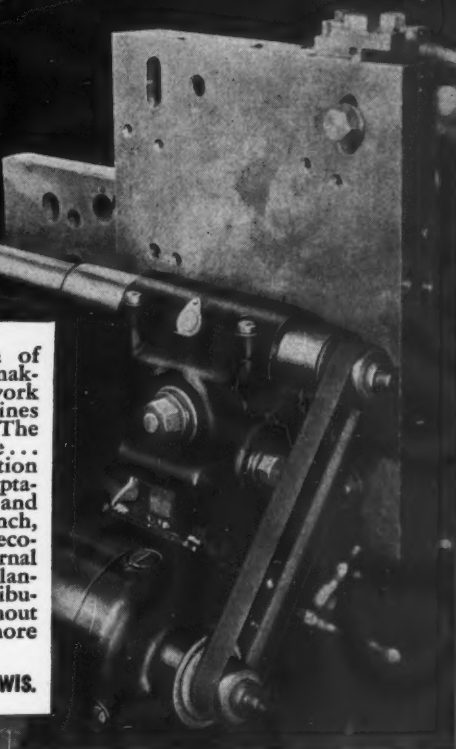
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DUMORE

Licks Another Tough Job

Dumore solved the problem of grinding forming rollers used in making pump tubing. Previously the work was done on specially built machines costing several thousand dollars. The work is now being done on a lathe... more accurately... and at a fraction of the former cost. Dumore adaptability, high speed extension quills and precision of 1/10,000 of an inch, have made possible hundreds of economical set-ups—internal and external—on lathes, milling machines, planers and shapers. Any of the distributors below will demonstrate—without obligation—any tool in the Dumore line of lathe and hand grinders.

THE DUMORE CO., Dept. 187-CRACINE, WIS.



THESE DISTRIBUTORS STOCK DUMORE TOOLS

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| AKRON—Hdwe. & Supply Co. | ERIE, PA.—H. P. Weller Sup. Co. | MOLINE, ILL.—John J. | RICHMOND—Smith—Courtney |
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| BALTIMORE—L. A. Benson | GREENVILLE, S. C.—Carolina | banks-Morse, Ltd. | Healy |
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| BOSTON—Chandler & Farquhar | (Elmwood) Stilliter-Holden, Inc. | gen Hdwe. Co. | Supply Co. |
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| W. M. Pattison Supply Co. | & Rusb. | W. B. Rapp, Machinery | TORONTO— |
| Strong, Carlisle & Hammond | LOWELL, MASS.—Nebes | PITTSBURGH—Standard-Ma- | Canadian Fairbanks-Morse |
| COALBURG—Osborne & Sexton | Machy. & Supply Co. | chinita Sup. Co. | TROY, N. Y.—Fred K. Blanchard |
| Machinery Co. | LOS ANGELES—Ducommun | PORTLAND, ORE.—J. E. Hasel- | TULSA—Mach. Tool & Supply |
| DALLAS—Briggs-Weaver | Metals & Supply Co. | time & Co. | Co. |
| Machinery Co. | Machinest Tool & Supply Co. | PROVIDENCE—Belcher & | WORCESTER, MASS.—Waite |
| DATTON—C. H. Gosinger Machy. | M. N. Thackberry | Loomis Hardware Co. | Hdw. Co. |
| DEVER—Hendrie & Bolthoff | MILWAUKEE—W. A. Voell | Brownell Machinery Co. | YORK, PA.—York Machy. & |
| Mfg. & Supply Co. | Machy. Co. | Reynolds Machinery Co. | Supply Co. |
| DEVER—Boyer-Campbell Co. | Western Iron Stores Co. | READING, PA.—Reading Ma- | EXPORT DEPT.—Dumore Co. |
| Chas. A. Strelinger Co. | MINNEAPOLIS—R. C. Duncan | chine & Tool Co. | —New York |

to understand. When a "fatigue failure" is encountered, the material has always been subjected to repeated stresses, usually hundreds of thousands or even millions of applications of force. The force application may be always from the same direction, or the direction of application may vary. If the force applied were sufficient,

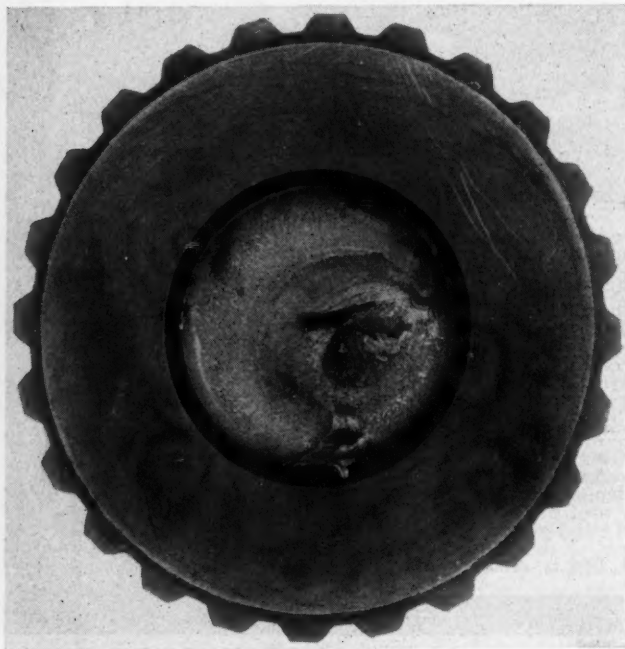
the "elastic limit" will be carried by the section. The section may be slightly deformed by a blow or load, but upon removal of the force it will resume its original dimensions.

If the piece is subjected to a large number of repetitions of stress below the elastic limit, it may or may not fail, depending on the magnitude of the applied stresses, the number of repetitions of stress, the homogeneity of the material, and its freedom from surface irregularities.

If the part is sound metal and has a smooth surface, failure is unlikely unless the endurance limit is exceeded, pressed in lbs. per sq. in., which can be applied to the metal repeatedly, millions of times, without causing failure. From the estimated maximum stress which will be applied, the proper section can be designed. Should the estimate be too low, the part will fail, in time, in service. Engineers usually allow an

ample factor of safety in design. Thus fatigue failures due to exceeding the endurance limit are probably rare.

More commonly, failure is due to surface flaws or irregularities, or to "dirty" metal (non-metallic inclusions), or to improper alignment of the moving part. In one case, a broken



This illustration shows the rear side of a steel gear which was turned integral with its shaft. Eventually, at the junction of the gear and the shaft, a crack developed which became greater with continuation of the part in service. As the surfaces of the fracture rubbed together, they became smooth, as shown. At last the break occurred, at the point which shows up as a dark spot. This completed the failure, thus this spot is still rough.

the piece would bend or break at a single blow, and, if broken, the break would be clean cut and the cause obvious.

Since most metals used structurally are able to deform elastically, structural parts are always designed so that any application of stress below

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ball bearing was sufficient to cause two successive failures in a Chevrolet rear axle. Tool marks or other notches or grooves, or bits of slag near the surface, may afford a starting point for the metal to "tear" under alternating stresses, just as a wire can be "notched" and then broken by repeated bending with far less effort than would otherwise be required.

Corrosive conditions may accelerate the failure, either by forming pits from which the fatigue break may start, or by widening the fatigue crack once it is started.

Building Large Electrical Apparatus

(Continued from page 80)

of this type of construction. The press was built in such manner that machining was not difficult, practically the only machining required being the working surface of the pressing bed, the drilling of the holes for pins, and the air cylinder mountings. The air cylinders were standard parts. None of the welding was highly stressed; therefore welding was held to the minimum.

Existing impregnating tanks for impregnating stator coils were too short to accommodate the new coils, so a new tank was built which will take coils up to 36 in. in length. This tank, of the horizontal type, is shown in operation in Fig. 8. The car for carrying the coils is in sections so that a single section of the car can be used when small loads are being treated. The illustration, however, shows all three sections connected together. At the bottom of the load can be seen some of the coils for the new stator. The cars are propelled by means of a power-driven chain carried beneath the floor line, to which the car is attached by means of a removable bar.



CLEEREMAN DRILLING MACHINES

• Sliding Head or Stationary—Round or Square Columns—Fully Geared—Anti Friction—Finest Automatic Oiling—The Newest Drilling Machine On The Market And The Outgrowth of More Than 20 Years' Experience In Building Drilling Machinery.

WRITE FOR
BULLETINS 101 and 102

THE CLEEREMAN MACHINE TOOL CO.
GREEN BAY • WIS.

A Modern Tool Control System in a Modern Plant

By A. H. BECKMAN

Works Accountant, A. O. Smith Corporation

A REDUCTION in the perishable tool inventory of \$8,748 in two years and a reduction in tool loss through breakage from \$90 to \$40 a month is the record that has been achieved in one toolcrib at the plant of the A. O. Smith Corporation, Milwaukee, Wis., through the installation of a modern system of tool control. In addition to the savings mentioned, an incalculable amount of time is saved due to the positive method of locating tools—either in or out of the toolcribs—and the speed with which all tool transactions are handled.

Previous to the installation of the present system, this plant used a tool checking system which was as simple as it was old, and as inefficient as it was simple. Through the growth and development of a vast industry; through the development of modern machines, tools, and methods; in a plant which is known throughout the industrial world for the high efficiency of its production equipment, this antique system of controlling the cutters, gages, and other "small tools" carried on to the best of its limited ability. And then the executives of this well-known corporation discovered the

FORM BY 18
A. O. SMITH CORP.

WORKMAN TOOL LOAN ORDER A No. 9054

Date 4-17-36

Clock No. 194 Tool No. 387

SHOW YOUR BUTTON

QUANTITY	SIZE	DESCRIPTION OF TOOL
1	2"	Mic

NOTICE TO WORKMAN
YOU ARE RESPONSIBLE FOR THE ABOVE ARTICLE.
RETURN YELLOW COPY OF THIS ORDER WITH TOOL AT WHICH TIME CRIB ATTENDANT WILL SURRENDER WHITE COPY AS YOUR RECEIPT.

WORKMAN'S SIGNATURE J. Wendt

Fig. 1—Workman Tool Loan Order. This form is made in triplicate, the original being filed on the workman's board, the triplicate in the tool record section, and the duplicate being given to the tool borrower.

McCaskey Tool Control System.

After the McCaskey System had been in operation in this plant for several months the excess amount of tool stocks became apparent. A reduction in the number of tools carried on hand in the toolcribs was not only possible, but imperative. At the first cut, the tool inventory was reduced by approximately \$5,000. The remaining stock was not only adequate, but as time went on the close check on tools that were being issued from the cribs seemed to aid in drawing out of their hiding places tools of which all trace had been lost, and again it became obvious that the bins contained too many tools. A second reduction in the tool inventory was made, amounting to \$1,200. Later another reduction of \$1,200 was made, and finally a last reduction was made, amounting to \$1,402—a total reduction in inventory of approximately \$9,000, covering a period of two years.

So much for the inventory dollars-and-cents angle. However, this is not the only way in which savings



Socket Screw Physical Properties

To know definitely the Tensile-Torque Yield Point, Elongation, Reduction of Area, etc., of the Socket Screws you are using, is necessary in order to keep pace with today's progressive strides in machine and tool design.

Holo-Krome FIBRO FORGED Socket Screws are TEN-TOR Tested (an exclusive Holo-Krome feature) to determine the necessary Physical Properties.

*New Catalog Now Ready!
write Dept. "H" for Cat. 20.*



THE HOLO-KROME SCREW CORP.
HARTFORD, CONN., U.S.A.



Fig. 2—At the left is the Workman's or "Clock Number Board" upon which are filed the original order for each tool issued. Each clip carries a tab bearing a workman's clock number.

were made. Under the old system the cost of the cutting tools, gages, micrometers, and other tools that were lost, strayed, or stolen each year amounted to a considerable sum. Under the present system the loss of a tool is very rare indeed. The crib attendants know where each tool is and can locate it instantly. For each tool that has been issued to a workman has not only the workman's number but also his signature; thus the arguments that wasted time and ruined otherwise good dispositions in the days of yore have been completely eliminated. No workman can deny his signature successfully, and if he fails to get his original order back when he returns a tool to the crib, it is his own fault.

The questions that naturally arise at this point are "Just how compli-

cated is a system that operates so efficiently?" and "How do the workmen like such a system?"

The procedure involved in drawing a tool from the toolcrib is perhaps not quite as simple as that required by the old system, but it isn't as inadequate and inefficient, either. Furthermore, the time saved on a complete tool transaction makes up — many times over — for the couple of extra seconds required for the borrower to sign his name in a tool-slip. And the workmen in this plant would rebel at once if an attempt were made to revert to the old method. No first-class workman likes to waste time standing around the toolcrib window with a number of others while the toolcrib attendant hunts for a lost tool-check. The accuracy and speed of the system also reduce the amount of work

ch, 1937

Complete Line Of

High
Speed
Steel

The Bright Blade

Special
Alloy
Steel

The Red Blade

Tungsten
Steel

The Black Blade

SIMONDS

"RED END"

HACK SAWS

for every metal cutting job

Now you can get Simonds "Red End" Hack Saw blades in three qualities for hand frames and power machines to cut every kind of metal straight and fast and at lower costs.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS., U. S. A.

required of the attendant.

When a workman calls at the tool-crib for a tool, he fills out a tool order blank similar to the form shown in Fig. 1, which is done while the attendant is fetching the tool. Writing with a pencil, the order is made in triplicate, the two top sheets having carbon backs. The original is white, the duplicate yellow, and the triplicate pink. The tool borrower writes his

partment illustrated in Fig. 3.

The yellow copies of the order in the workman's slipholder provide a personal record of the tools that are charged to him. The other two copies are, however, the main element of the tool control. The accumulation of white and pink slips for each tool issued automatically records and classifies the entire tool distribution. They enable the crib attendant to tell in-



Fig. 3—Tool Record. For each tool that is loaned, a copy of the order is filed behind one of these clips, which carries the location number for the tools indicated and the perpetual inventory card.

clock number, the date, size and kind of tool desired, and signs his name.

Each tool is identified by the number of the bin in which it is stored. This number is entered on the order by the crib attendant and the tool is handed to the workman together with the yellow copy of the order. This the workman keeps in a slipholder at his machine or work bench. The white copy of the order is filed according to the workman's clock number on one of the ticket boards shown at the left in the photograph Fig. 2, and the pink copy is filed in the tool record com-

partment just what tools have been issued to each workman, and the exact location of each and every tool that has left the crib. These copies also furnish valuable data on many other phases of tool handling and use.

During a rush period the attendant hands out tools and yellow slips rapidly, but delays filing the white and pink slips until the rush is over. This speeds up service and permits the men to return to their work much sooner than would be possible otherwise.

As long as the white copy of the tool order remains on file, the tool which it

Are Out-of-Date Hand Methods keeping your Maintenance Costs Too High ?

**MODERNIZE for Economy, with these three
Low Cost Black & Decker Electric Tools**



OPENING 2" HOLES IN A TANK for installing pipe lines with the $\frac{1}{2}$ -Inch Junior Drill and a Black & Decker Hole Saw. The $\frac{1}{2}$ -Inch Junior handles countless drilling jobs in wood, metal, composition, etc. With Black & Decker Hole Saws, it cuts clean, round holes from $\frac{3}{4}$ " to $3\frac{1}{2}$ " diameter in any material a hacksaw will cut. Price—**only \$35.00.**

REMOVING OLD PAINT with the 7-Inch Junior Sander. Ideal for quickly smoothing and finishing metal and wood surfaces for painting—removing rust and paint—smoothing welds, casting ridges—rubbing down lacquer with felt pad. Saves hours of hand work with sandpaper, emery, files, etc. **Only \$39.50.**



DRILLING TO REMOVE BROKEN BOLT with the Black & Decker $\frac{1}{4}$ -Inch Junior Drill—one of the thousands of drilling operations in wood, metal and composition on which it cuts maintenance costs and speeds repairs. The $\frac{1}{4}$ -Inch Junior is husky and powerful—built for years of service. Yet it costs **only \$19.50.**

Ask your jobber to demonstrate these three tools, and other Black & Decker Tools for maintenance work, right on the job in your plant. Or write for complete information. Black & Decker Mfg. Co., 720 Pennsylvania Ave., Towson, Maryland.

BLACK & DECKER

World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

A. O. SMITH CORP.		FORM OS 21 2M 2EYES 22	
BROKEN TOOL CLAIM			
DATE 3-1-36		DEPT. NO. 28	
CLOCK NO.		VALUE	
QUANTITY	SIZE	DESCRIPTION OF TOOL	
1	1/2"-13	Tap	
REASON			
Hole not drilled thru			
THIS SLIP MUST BE APPROVED BY FOREMAN.			
FOREMAN: J. Wendt			
DISPOSITION			
Repair <input type="checkbox"/>	Salvage <input type="checkbox"/>	Scrap <input checked="" type="checkbox"/>	

Fig. 4—Broken Tool Report. When a damaged tool is returned to the crib, it must be accompanied by one of these reports, signed by the department foreman.

represents is charged to the workman who drew it. When he returns the tool to the crib, he returns the yellow copy of the order with it, and receives the white copy in return. The white copy is identified from the serial number on all three copies of the tool order. The clearance takes but a few seconds if the tool is in good condition. The workman destroys the white copy, and thus knows that his responsibility for that particular tool is ended.

At the first opportunity, and identifying it from the yellow slip, the attendant removes the pink slip from the tool section. The pink copies, and in some cases the yellow ones, are retained to provide data for tool activity records, analyses, tool inventory and investment control, defective tool reports, and other records.

A broken or defective tool will be accepted by the crib attendant only when accompanied by an explanatory report, Fig. 4, which must be okayed by the foreman in charge of the employee returning it.

This report or "claim" is made in duplicate. Both copies are sent to the

toolcrib. The original serves for a release for the broken tool, and the duplicate, printed on green paper, is filed. Periodically these green copies are sent to the main storeroom to be turned in for replacements and to aid in keeping the tool records straight. If no replacements are immediately available, due credit is given to the toolcrib for these tools. If the breakage was due to carelessness on the part of the workman, the original copy of the report may be filed at the back of the compartment under his number. An accumulation of such reports indicates that there is something wrong, either with the workman or with the equipment upon which he is employed. These reports have been known to provide a basis for raising the efficiency of whole departments.

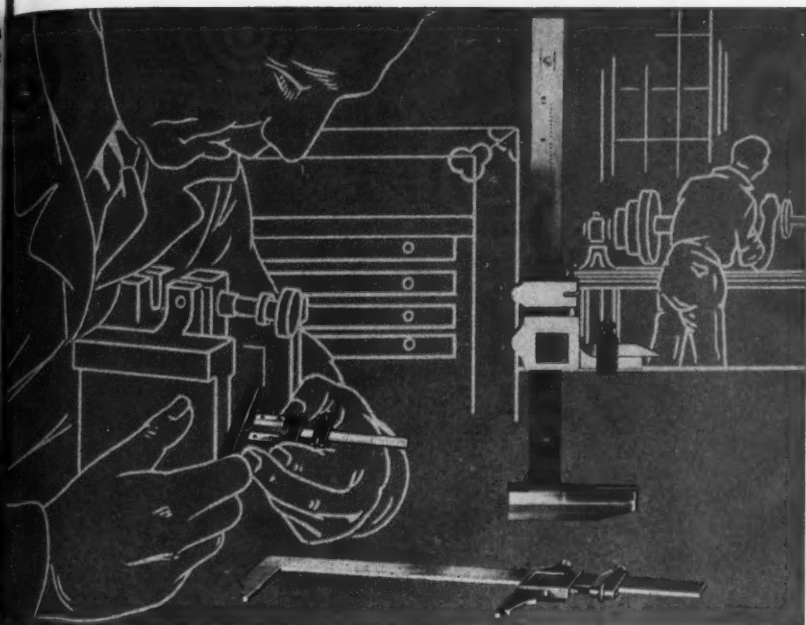
If the tools are found to be at fault, the reports may be filed in the tool

TOOL ITEM							PRICE
9-C-2-B							
1/2-9 H.S. Ext. Drill							3.05
1937	35	36	37	38	39		
AUG.	12	14					
SEP.	9	8					
OCT.	3						
NOV.	6						
DEC.	12	8					
JAN.	16	5					
FEB.	4	2					
MAR.	9	2					
APR.	9	6					
MAY	7	5					
JUNE	12	15					
JULY	8	9					

Fig. 5—Perpetual Tool Inventory Card.

compartments back of the pink slips. Thus an accumulation of these slips may indicate that certain brands or types of tools are inferior for the purposes designated, or when used under

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PRICE
3.65

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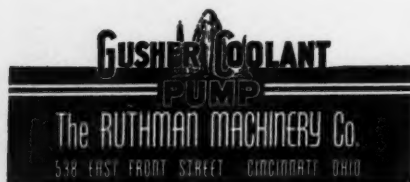
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certain conditions. When the tool can be repaired, the report may serve as a repair order, indicating the department to which costs are to be charged. When a tool is scrapped, a copy of the report may provide the accounting department with the basis for a charge against the department responsible and a credit to the tool investment account. If the tool is to be replaced, the explanatory report may be attached to the requisition, justifying the issuance of a new tool from stock.

The card indicated as Fig. 5 is a perpetual tool inventory card, which is placed at the back of each tool compartment. The card is long enough to project above the pink order copies, so that the description and bin number can easily be seen. The price of the tool is also listed, and a monthly record is maintained of these tools on hand. Thus an accurate inventory may be taken at any time without interrupting normal crib operation.

One of the most important features of this system consists in that it is unnecessary to replace tools in the bins before the men who return them can be cleared. The borrower is given the white slip at the instant the tool is returned, and the tools may then be held out for inspection and reconditioning. Thus an accumulation of damaged and dull tools in the bins is avoided and the entire stock of tools can be kept in readiness for use.

40 Volt Simplified Electric Arc Welder. The Hobart Brothers Company, Box PR-173, Troy, Ohio, is now distributing an attractive new 24-page catalog describing the new 40 Volt Simplified Electric Arc Welder which has been developed by this firm. In addition to a complete description and illustrations of the welder, the catalog contains many illustrations of the various jobs that can be handled efficiently with this machine. Each feature of the welder is taken up in turn and the various details of the machine are shown at close range. Specifications are included. Copy free.

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Photographs look-
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face of the teeth,
taken from view-
point of the work.

The method used in cutting Bite-Rite files staggers the teeth, as seen at the right. Original with Disston and different from any other, it produces a file that combines speed, long life and smoothness of filed surface.

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Keen....Fast....Smooth....



Smoothness of file tooth. Notice the smooth, wavy cutting edge of the tooth, which is the result of the new method of cutting the teeth.



Old-fashioned cutting. Notice the jagged, uneven cutting edge of the tooth, which is the result of the old method of cutting the teeth.



New Fast Speed. Notice the smooth, wavy cutting edge of the tooth, which is the result of the new method of cutting the teeth.

For Samples Write your Distributor of Disston BITE-RITE Files
HENRY DISSTON & SONS, INC., Philadelphia, Pa.
SAWS - TOOLS - FILES - KNIVES - STEEL

Die Casting Ingenuity Makes Synthetic Cream Feasible

BY NORMAN A. PARKER

President, Parker White-Metal and Machine Co.

AN instructive example of developing a new product for market is offered by the progressive design history of the Macreamer Emulsifier. The unit is planned primarily to trim dollars from restaurant and institutional kitchen expenses by making high grade genuine cream from skimmed milk and sweet butter.

The original inventor's model was

sify and streamline the aluminum base resulted in too bulky a unit and weakness at the gland-end of the pressure cylinder as shown by the piece at the rear right. The Parker White-Metal and Machine Company, who now manufactures the complete apparatus, therefore turned to zinc alloys die cast about simple previously die cast aluminum inserts, these inserts forming the cylinder walls with which the food comes in contact. By this procedure bulkiness and cost were both radically reduced, and a better designed piece, capable of being used as cast and without machining, was produced.

The die for pressure casting the zinc base was so built that parting was along the plane of symmetry and that the metal cored out of the bottom of the base was blocked off by a simple cover die core. This design was particularly foresighted inasmuch as the first castings, shown in the illustration at the front left, were found to be insufficiently resistant to bending and required basal ribbing. Without additional rigidity in the base the steel pressure piston of the assembled apparatus would drive slightly out of line with the aluminum cylinder walls on the forward stroke, and contaminate output cream with metal scraped off the cylinder wall. To supply the necessary ribbing was simple, however, in view of the die construction.

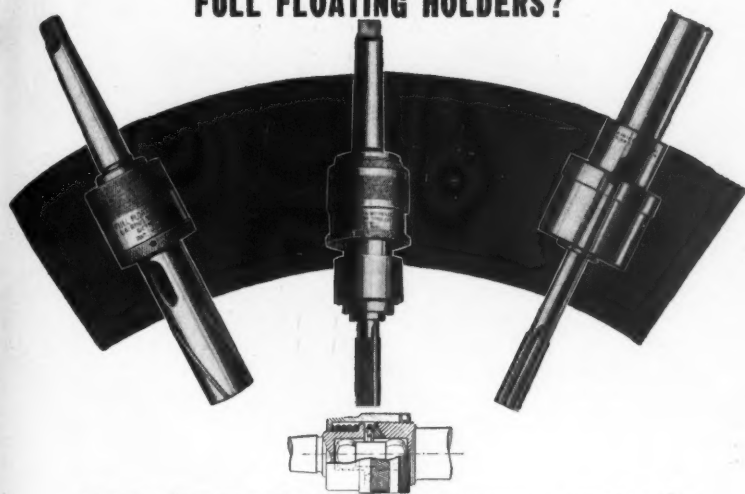
Two semi-circular rib slots were first milled into the core block, and



Fig. 1—To make one's own cream at fifty percent savings in commercial kitchens—thanks to the diemaker's skill.

built around a base sand cast shown at the rear left in the illustration Fig. 2. However, the casting in aluminum was difficult to machine, was too porous, and resulted in a product hard to clean. Experimental efforts to den-

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Gairing floating tool holders provide positive correction for mis-alignment.

Accurate work depends more upon the holder and cutting tool assemblies being in perfect alignment with the fixture without deflection from the machine spindle than on any other factor.

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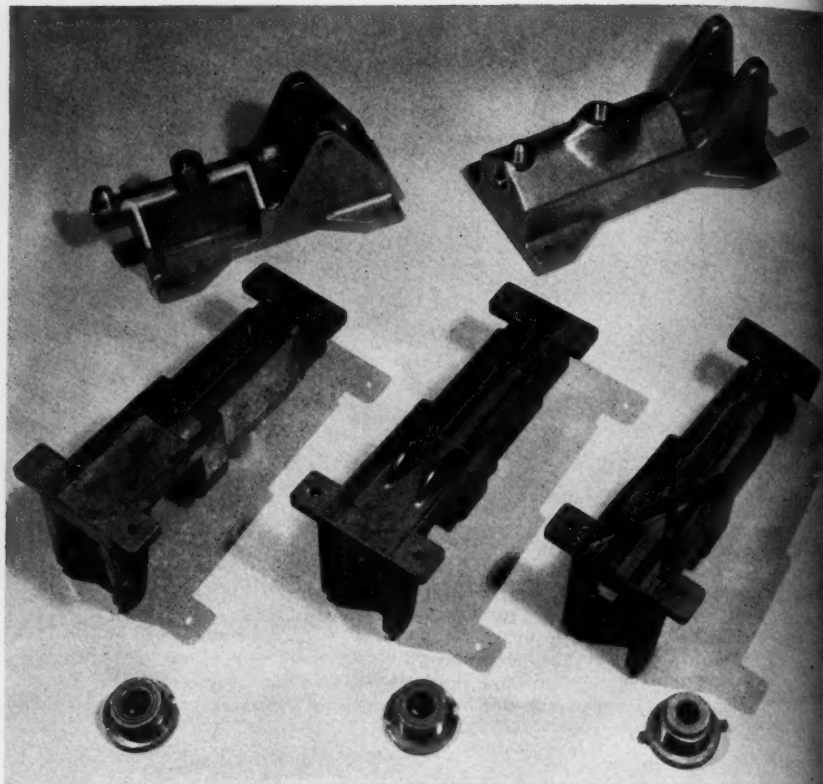


Fig. 2—Steps in designing for production—from inventor's sand casting to ribbed die cast zinc alloy.

castings such as those at the front center of the illustration were made. This assisted in eliminating cream darkening to a noticeable degree, but did not wholly correct the tendency. Accordingly, additional slots were milled and more complex cross-ribbing was secured. These castings are shown at the front right. In this fashion, thoroughly satisfactory die castings were secured with but minor die revisions.

In addition to the base casting of the emulsifier, both the operating

handle of the machine and the milk-and-butter bowl were changed from machined sand cast parts to die cast parts when the apparatus was redesigned for production. The handle was die cast of zinc for superior strength and lower cost, the bowl of aluminum for contact with food materials. Miscellaneous small screw machine parts were also replaced by die castings.

An additional point of design worth mentioning is the packing gland for the pressure piston. When the zinc

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"The Facts About Rotor High Cycle Tools"

This new booklet gives the engineering, production and operating facts about High Cycle Electric Tools and describes the entire line of Rotor High Cycle Tools. **A copy is yours for the asking.**

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alloy base was first used, a rawhide-leather liquid retainer, backed by coil spring encased in a steel washer-like assembly, was tried. In contact with milk, however, the steel was found to corrode. The next step was to inset the rawhide gland in a recess behind stainless steel retainer rings. However, better and final results were secured through eliminating all steel parts and using a simple asbestos-rubber packing ring under compression, the main body of the gland, with its wrench flange and threads, being a zinc alloy die casting.

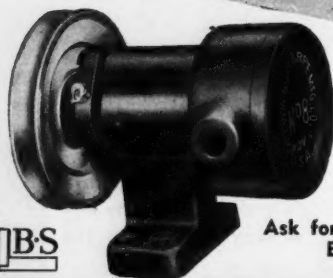
The assembled unit is built for service; not show. In the commercial kitchen the device may be used to make oil mayonnaises and salad dressings as well as low-cost cream. The Rudell Corporation of Burnside, Pennsylvania, holds the manufacturing rights and controls the distribution of the product.

Carboloy Bulletin On Grade Selection. Much information of practical value to users or prospective users of cemented carbide tools is contained in Engineering Bulletin No. TA-371, just issued by Carboloy Company, 2975 E. Jefferson, Detroit, Michigan, on the subject of proper carbide grade selection. This 12 page bulletin explains the necessity of considering (1) type of material being machined (2) name of part to be machined (3) machining specifications and (4) type of machine used, in the selection of cemented carbides.

An extremely useful section of this bulletin is that devoted to an alphabetical listing of iron, steel, non-ferrous metals and non-metallic materials with the suggested grades of Carboloy for roughing and finishing operations on each material. Supplementing this is a list of Carboloy grades giving their physical characteristics and recommended applications.

The entire bulletin is designed so that it is relatively easy for one to choose the grade suitable for his particular job. In the selection of cemented carbides, the data contained in TA-371 should prove exceptionally helpful. Copies of this bulletin free upon request.

Use No. 8 VANE
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March, 1937

MODERN MACHINE SHOP 105

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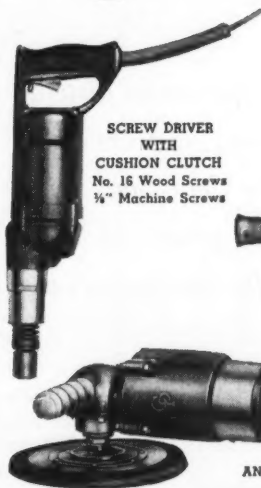
1/4" MIDGET DRILL



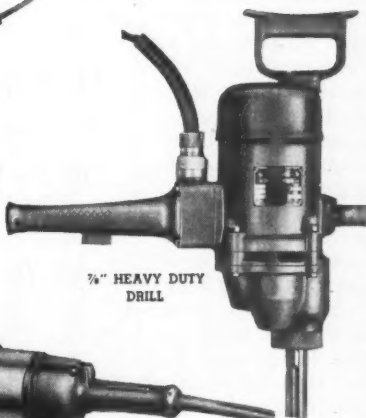
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1/4" Steel
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No. 16 Wood Screws
3/8" Machine Screws



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\$200,000 in Awards

to be distributed by

The James F. Lincoln

Arc Welding Foundation

ONE of the richest awards ever established for competition in the field of mechanical science has just been announced by The James F. Lincoln Arc Welding Foundation. To stimulate intensive study of arc welding, \$200,000 will be distributed by the Foundation among winners of 446 separate prizes for papers dealing with this subject as a primary process of manufacture, fabrication or construction in eleven major divisions of industry.

The principal prize winner will receive not less than \$13,700. Other prizes range from \$7,500 to \$100 — the latter sum to be awarded each of 178 contestants who receive no other prize, but whose papers are adjudged worthy of honorable mention.

In order to assure equal competitive opportunity, similar prizes are offered in the eleven major divisions of industry covered by the contest. These divisions are: Automotive, Aircraft, Railroad, Watercraft, Structural, Furniture and Fixtures, Commercial Welding, Containers, Welderies, Functional Machinery and Industrial Machinery.

446 Prizes to be distributed ranging from \$13,700 for the Grand Prize to 178 prizes of \$100 each for the runners-up.

Wide diversification of awards is effected by further dividing each major industry into various sub-classifications; with entrants required to select in advance the particular sub-classification to which their papers will relate.

When accepted by the Jury of Awards as properly classified, each paper will be in competition, in its particular sub-classification, for five initial prizes established for that group. These are worth, respectively, \$700, \$500, \$300, \$200 and \$150.

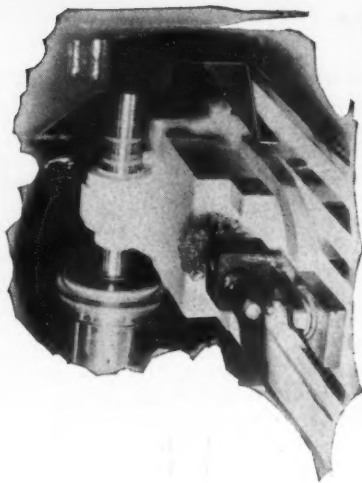
From among these sub-classification winners, four papers will be selected in each major industry to receive additional prizes of \$3,000, \$2,000, \$1,000 and \$800. Thus these 44 semi-finalists will be awarded a total of \$74,800.

In addition, the semi-final winners in the various divisions will be considered as possible recipients of the four Main Prizes. These range from \$10,000 to \$3,500, with the winner of the Grand Prize receiving not less than \$13,700 for his paper.

Analysis of the complete prize offered shows the following:

Cutting Lubricant: 1 part Sunoco to
25 parts water.

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Brown and Sharpe Manufacturing Co.
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Operation: Climb Milling.
Machine: Brown and Sharpe No. 12
Plain Milling Machine.
Material: Tool Steel.
Stock Removal: .250 in. — .375 in.
Spindle Speed: 95 R.P.M.
Cutting Speed: 85 feet per minute.
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25 parts water.

FOR maximum production in milling operations, Sunoco has long been the choice of leading machine shops.

On the finer work, continuous accuracy and superior finish are assured with Sunoco.

Your cutters, aided by Sunoco, will produce more pieces per cutter grind, and the cutter cost per piece will thus be reduced. Cutters will not burn, chips will not seize, and the cuts will be clean and even.

Under actual operating conditions, Sunoco has shown time and again that its lubricating and cooling characteristics help milling cutters give the quantity and quality of production which modern machine shop practice demands.

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SUNOCO
EMULSIFYING
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1. In the Automotive field, twenty-four prizes with a total value of \$14,200. These to be awarded papers submitted under four sub-classifications; namely, Engines, Bodies, Frames and Trailers.

2. In the Aircraft field, fourteen prizes with a total value of \$10,500. Sub-classifications for the Aircraft industry are two; namely, Engines and Fusilage.

3. In the Railroad field, twenty-four prizes with a total value of \$14,200. Four sub-classifications are made of the Railroad industry; namely, Locomotives, Freight Cars, Passenger Cars and Locomotive and Car Parts.

4. In the field of Watercraft, fourteen prizes with a total value of \$10,500 are established. Sub-classifications in this division of industry are two; namely, Commercial and Pleasure.

5. In the Structural field, twenty-four prizes are offered; with a total value of \$14,200. Four sub-classifications are established in this division; namely, Buildings, Bridges, Houses and Miscellaneous.

6. In the Furniture and Fixtures division, the prizes number fourteen; with a total value of \$10,500. Two sub-classifications are set up; namely, House and Office.

7. For the Commercial Welding division, fourteen prizes worth a total of \$10,500 are set up. The two sub-classifications established are: Job Shops and Garages.

8. In the Containers division, fourteen prizes with a total value of \$10,500 are established. This division is split into two sub-classifications; namely, Contents Stationary and Contents Moving.

9. In the division of Welderies, \$10,500 will be distributed in fourteen prizes. This division has two sub-classifications; namely, Commercial and Departments of Plants.

10. In the Functional Machinery division, fifty-four prizes with a total value of \$25,300 are set up. This division is partitioned into ten sub-classifications; namely, Metal Cutting, Metal Forming, Electrical, Prime Movers, Conveying, Pumps and Compressors, Business, Jigs and Fixtures, Parts, and Not Otherwise Classified.

11. In the division of Industry Machinery, prizes number fifty-four, with a total of \$25,300. This division also has ten sub-classifications; namely, Process, Construction, Petroleum, Steel Making, Farming, Household, Food-Making, Textile and Clothing, Printing, and Not Otherwise Classified.

To participate in this contest, it is necessary that submitted papers describe either the redesign of an existing machine, structure, building, etc., so that arc welding may be applied to its manufacture; or that they present a design (either in whole or in part) of a machine, structure, building, etc., not previously made — the description to show how a useful re-



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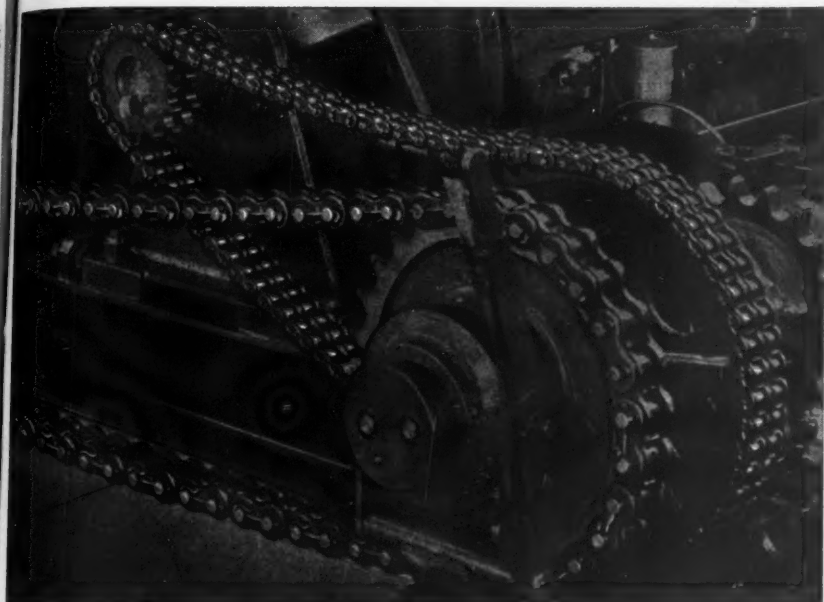
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WHITNEY

sult, which was impractical with other methods of construction or could better be done by arc welding, is obtained.

In certain classifications, however, slightly different eligibility requirements obtain. In the divisions of Commercial Welding and Welderies, for example, owners and operators of functioning establishments may enter the competition with papers which describe details for successfully conducting such a business.

Contestants, it was announced, must have papers in duplicate on file with the Secretary of the Foundation, at Cleveland, Ohio, not later than June 1, 1938. Prospective entrants should communicate promptly with Foundation Secretary A. F. Davis, P. O. Box 5728, Cleveland, for complete details of the rules and conditions covering awards.

This competition, with its long list of valuable prizes, marks the first announced activity of the Foundation since its establishment, at the close of 1936. Already, however, the Foundation has received wide acclaim among educators and publishers in the engineering world.

Congratulatory messages describing the Foundation as a "forthright and purposeful action in the interest of industrial progress", and as a "very constructive and forward looking plan—to stimulate and recognize achievement in the field of arc welding", have been received from more than a score of Presidents and Deans of America's leading technical schools and colleges.

Summarizing the expressed opinions of many outstanding leaders in the field of technical publications, a recent letter to trustees of the Foundation from the head of an important publishing firm states:

"The future of this country depends, in large measure, on the degree to which manufacturers take advantage of technological development and mod-

ernized processes, so that they can make more for more people to enjoy. It is through work which will be accomplished by such public-spirited activities as The James F. Lincoln Arc Welding Foundation that this goal will be reached."

While many industrial methods and new processes of great benefit have been made available in recent years with the aid of the electric arc, Dr. E. E. Dreese, Head, Department of Electrical Engineering, Ohio State University, Columbus, and who is Chairman of the Jury of Awards of the competition, has pointed out that the full measure of arc welding's value in industrial production has hardly been tapped.

"By stimulating the ingenuity of scientists, engineers and skilled workers through our present competition", Dr. Dreese declared, "lower production costs should be made possible for thousands of devices and commodities now employed in manufacture or moving in commerce. The sole object of this award is to give constantly increasing markets the benefit of better, stronger and more serviceable goods."

Dr. Dreese emphasized the fact that the competition may be entered by any person, or group of two or more persons; the sole limitation being that any contestant may enter only one paper, on only one subject, in only one of the sub-classifications listed.

Further, each contestant must actually have participated in work upon which the subject matter of his paper is based; and the contestant's exact relation to that work, and to the producing or developing organization, must be clearly stated.

Employers are particularly invited to urge their qualified workers or associates to communicate with the Foundation promptly, and prepare to submit papers for some of the substantial awards offered.

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General Rules and Conditions of Lincoln \$200,000 Prize Contest

IN order to stimulate greatest study of arc welding, this Contest embraces practically every field of industry where arc welding can be applied as a primary process of manufacture, fabrication or construction. Any of literally thousands of subjects can be selected for papers. The unlimited opportunities for participation are indicated in the following breakdown of industry into 11 main classifications and 44 sub-classifications.

Prizes are offered in the sub-classifications and main classifications in addition to the main prizes of the contest.

Main Classification	Sub-Classification
A—Automotive	A-1 Engines A-2 Bodies A-3 Frames A-4 Trailers
B—Aircraft	B-1 Engines B-2 Fuselages
C—Railroad	C-1 Locomotives C-2 Freight Cars C-3 Passenger Cars C-4 Locomotive and Car Parts
D—Watercraft	D-1 Commercial D-2 Pleasure
E—Structural	E-1 Buildings and Similar Structures E-2 Bridges E-3 Houses E-4 Miscellaneous
F—Furniture and Fixtures	F-1 House F-2 Office
G—Commercial Welding	G-1 Commercial Welders or Job Shops G-2 Garages or Service Stations
H—Containers	H-1 Contents Stationary (tanks, etc.) H-2 Contents Moving (pipe lines, etc.)
I—Welderies	I-1 Commercial Welderies I-2 Plant Welderies

J—Functional Machinery

- J-1 Metal Cutting
- J-2 Metal Forming
- J-3 Electrical
- J-4 Prime Movers
- J-5 Conveying
- J-6 Pumps and Compressors
- J-7 Business
- J-8 Functional Machinery Not otherwise Classified
- J-9 Jigs and Fixtures
- J-10 Parts of Functional Machinery

K—Industry Machinery

- K-1 Processing
- K-2 Construction
- K-3 Petroleum
- K-4 Steel Making
- K-5 Farming
- K-6 Household
- K-7 Food Making
- K-8 Textile and Clothing
- K-9 Printing
- K-10 Industry Machinery Not Otherwise Classified

A total of 446 prizes are provided for papers in this Contest. From the 44 sub-classifications, 220 papers will be selected to receive prizes totaling \$81,400.

From the 220 papers receiving prizes in the sub-classifications, 44 papers will be selected to receive prizes totaling \$74,800 in the main classifications.

From the 44 papers receiving prizes in the main classifications, papers will be selected to receive the four main contest prizes totaling \$26,000.

Additional Prizes — 178 prizes of \$100 each are provided for papers which do not share in any other award but which in the opinion of the Jury of Award deserve Honorable Mention. These may be selected from any classification.

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WINDSOR ONT

Grand Prize—\$13,700

The winner of the grand prize for the contest will receive \$13,700. He will receive the First Prize of \$10,000 for the contest, the first prize of \$2,000 for his main classification and the first prize of \$700 for his sub-classification.

Eligibility of Contestants

The prize contest may be entered by any person, or group of two or more persons. Any contestant, or group, may enter only one paper on only one subject in only one of the classifications previously listed. Payment will be made to person or persons signing the paper. Neither the founder, its employees, its officers, its advertising agency nor its distributing agents shall be permitted to contest for any award or benefit of the contest, and no award shall be given to any such party or person.

To be eligible, each contestant must have actually participated in work upon the subject matter upon which his paper is based. The work described in the paper should be the product of the company or firm with which the contestant is or has been connected. The contestant's connection with the company or concern may be either in the capacity of employee or consultant. Consulting engineers may have the work on their product done by a job welding shop.

Other persons, or groups of persons, not so affiliated, may submit a paper on the design of any machine, structure, building, manufactured or fabricated product.

The contestant's exact relation to the work and to the producing or developing organization must be clearly stated to assure eligibility.

Subject Matter of Papers

Participation in this contest necessitates submission of a paper which shall describe one of the following:

- (A) **REDESIGN OF EXISTING MACHINE STRUCTURE, BUILDING, ETC.** A machine structure, building, manufactured or fabricated product of ferrous or non-ferrous metals within the limits hereinafter prescribed, previously made in some other way, which has been redesigned in whole or in part, so that arc welding may be applied to its manufacture.
- (B) **NEW DESIGN OF MACHINE, STRUCTURE, BUILDING, ETC., NOT PREVIOUSLY MADE.** A machine structure, building, manufactured or fabricated product of ferrous or non-ferrous metals within the limits hereinafter prescribed, not previously made but which has been designed in whole or in part for the use of arc welding, the description to show how a useful result, which was impractical with other methods of construction, or could be better done by arc welding, is obtained. To qualify, the machine, structure, building, manufactured or fabricated product so designed need not have been manufactured or built at the time of the writing of the paper.
- (C) **ORGANIZING, DEVELOPING, AND CONDUCTING A WELDING SERVICE.** The welding service to be described in the papers may be conducted by commercial welders or job shops (G-1), garages or service stations (G-2), commercial welderies (I-1) or plant welderies (I-2).

Note that the machine, structure, building, manufactured or fabricated product under (a) or (b) may be designed either in whole or in part for the use of arc welding. However, preference will be given to papers describing products showing fullest use of arc welding.

Limitation of Subject Matter

In order to be eligible as to subject matter, the machine, structure, building, manufactured or fabricated product, with respect to which the paper is submitted, must have been actually designed. However, machines, structures, buildings, manufactured or fabricated products will be excluded from this Contest which have been designed for welding and sold in the open market, or generally used, prior to January 1, 1937. Nevertheless, any preliminary studies, investigations or laboratory work conducted at any time will be admitted as part of any paper, provided the finished product referred to was not sold in the open market.

BULLARD

TYPE "J"

MULT-AU-MATIC

For Greater Profits

Small work requiring higher speeds and higher feeds can usually be done more profitably on smaller high-speed machines.

To meet the demands in this field, the Bullard Type "J" Mult-Au-Matic is available. It includes many of the features of the heavier Type "D" series, but has in addition many features found necessary for the Efficient operation of higher speed units.

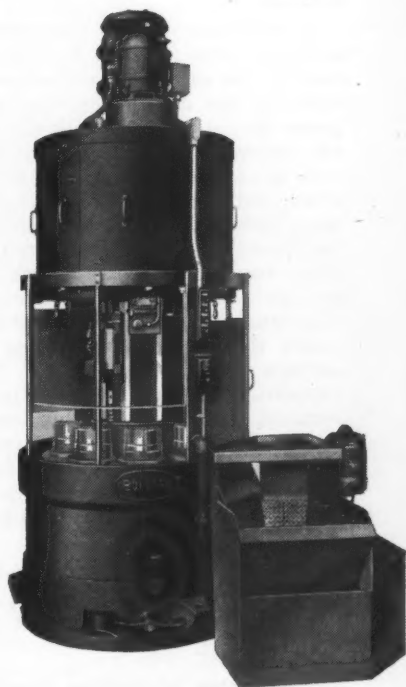
Exceptional feed and speed ranges, individually independent and variable at each station, broaden the scope and possibilities of time reduction on many operations. Mechanical power operated chucking facilitates the loading and unloading of work in the minimum periods of time allowed by the fast cycle time.

Electrical push button stations provide for ease and flexibility of control and manual operation.

Double Index is obtainable to meet the requirements of 1st and 2nd chucking on the same machine.

Fast indexing and Rapid power traverse of tools to and from point of cutting minimize lost time between cuts.

Time Saved is Money Earned. Don't delay your investigation of these machines as applied to your jobs. Ask for Estimates, and compare these with the best previous methods used.



Type "J"

Machine Sizes

7 inch—8 Spindles

11 inch—8 Spindles

THE BULLARD COMPANY

BRIDGEPORT

CONNECTICUT

nor generally used, prior to January 1, 1937.

Treatment of Subject Matter

The description of the machine, structure, building, manufactured or fabricated product featured in the paper must be expressed in practical language and be of sufficient clarity to be readily understood by those skilled in the art. Any photographs, drawings, charts, etc., which will add clarity to the description, should be included.

Comparisons as to proportionate savings, gross savings, performance, service life or social advantage provided by the design described in the paper should be made with the previous design and method of construction. In case of a design of a new machine, building, structure, etc., these same items should be considered by the contestant and compared with other methods of construction. Any savings claimed must be clearly substantiated. Any reasonable method by which the Contestant believes these savings can be proved will be acceptable. It is suggested that the contestants follow the method outlined in the Procedure Handbook of Arc Welding Design and Practice for calculating welding costs. The Procedure Handbook is published by The Lincoln Electric Company.

In making comparisons and estimates of cost, particular attention should be paid to direct labor and material cost.

Presentation of Subject Matter in Papers

All papers submitted in this contest must present their subject matter in accordance with the following method of presentation:

Subject matter, including both text and explanation, must be written in the English language.

Text must be typewritten on one side only, of paper approximately $8\frac{1}{2}$ " x 11" in size. Text must be securely bound and have a protecting cover.

Text illustrations and drawings mounted if necessary, must be securely bound, preferably with the text.

Classification of the Paper as to Subject

The contestant will classify his paper as he desires. The classifications above made have been intended to cover the industries in which the study and research is to be made. If any doubt exists in the contestant's mind, he should study the classifications to determine whether his paper may be better used in one classification than in another. An example of a product which might be considered in more than one classification would be a pump. If the pump is for general use in several industries, it should be classified as J-6 (see under J-Functional Machinery). If the pump is a special design for a specific industry, it should be properly classified under K, (see Industry Machinery). Without obligation on its part to do so, the Jury of Award in exceptional cases may re-classify the contestant's paper if it can do so to his advantage.

Papers must be submitted in duplicate, one signed by the contestant and enclosed in a separate, sealed envelope with the following information clearly written on the cover sheet of the paper and on the outside of such sealed envelope:

Name, address and signature of the contestant;

Name of concern building the product described in the paper;

Relation between the contestant and the concern building the product;

The classification for which the paper is entered.

PRECISION GRINDING



**Die Grinding at
Dominion Drop
Forge Company.**



**Haskins HS-4, a
six-speed all-pur-
pose machine. Readily
handles grinding wheels
up to 4" diameter by $\frac{3}{8}$ "
face.**

● Haskins Equipment meets all de-
mands . . . for precision work . . .
for increased production and low-
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flexibility . . . for ability to "stand-
up" under "pressure" . . . for qual-
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If you are Grinding, Sanding, Filing,
Cleaning, Wire-brushing or Polishing—in-
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Write today for your copy of
catalog No. 44—it's full of valu-
able information. R. G. Haskins
Co., 4667 W. Fulton St., Chicago.

Haskins

FLEXIBLE SHAFT EQUIPMENT
with Greater Adaptability

The contestant at the same time shall enclose in another envelope a duplicate of such paper, which shall not be signed, but it shall have on it and on the envelope in which it is to be placed, only a statement of the classification for which the contestant enters the paper.

These two envelopes shall then be placed in a large envelope, addressed, "Secretary, The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio."

All papers must be submitted within the time hereinafter stated.

All Papers Kept Confidential

When received by the Secretary, the envelope in which both papers are enclosed will be opened by the Secretary of the Foundation and immediately the same identifying number will be given to the envelope containing the signed paper and the envelope containing the duplicate unsigned paper. The envelope containing the signed paper will be retained, unopened and confidential. The envelope containing the duplicate paper, with the number identifying the contestant and the endorsement of the contestant of the classification for which the paper is entered, will be delivered, unopened, to the Jury of Award with other contesting papers at the close of the contest.

The object will be to treat all papers confidential, without disclosure, until the Jury of Award considers the identified but unsigned contesting papers. When the Prize papers are selected by the Jury of Award, proper certificate thereof will be made upon the number of the paper so submitted, and then identified with the original paper on file with the Secretary, and payments thus made to the winners by the Foundation.

Judging of Papers

In rating merits of each paper, the

Jury of Award will give equal consideration to the following factors.

1. Proportionate cost saving in percentage of the design described in the paper over previous design and previous method of construction.

2. The gross savings accruing to industry through the general adoption of the design described.

3. Increased service life, efficiency and general economy and social advantage provided to mankind by the design described.

All of these advantages should be clearly stated and substantiated, by the contestant.

In case of a new, not heretofore built machine these advantages over any other possible method of building should be stated and substantiated.

Since Classifications G (Commercial Welding) and I (Welderries) do not cover design or construction of any kind but do cover the methods of organizing, developing and operating a business, papers entered in these two classifications will be judged on their completeness and thoroughness in covering the respective subjects.

Close of the Contest

Only papers contained in envelopes postmarked not later than June 1, 1938, and received in Cleveland not later than July 1, 1938, will be accepted. Personal delivery of papers will not be accepted. Upon receipt of the manuscript in Cleveland, the contestant will be notified by mail.

Publication of Papers

Contestants who do not care to have their papers published should so state. No papers shall be published if so requested by the contestant and his company. In case papers are published in whole or in part, no compensation will be paid, but the contestant's name will be given unless he shall request otherwise.

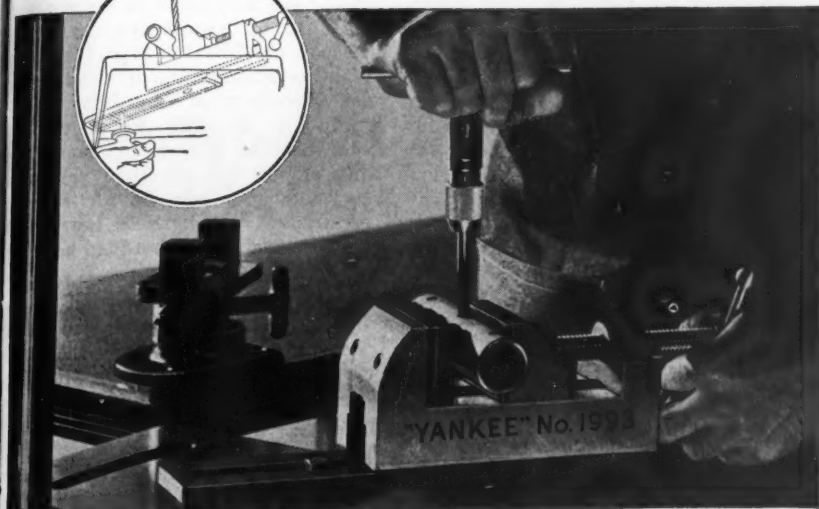
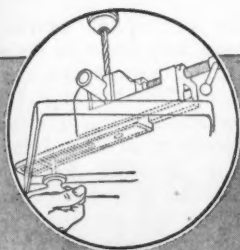
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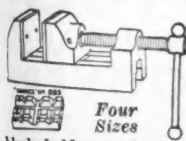
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Save time, labor; assure accuracy with "YANKEE" Vises and Vise Clamps

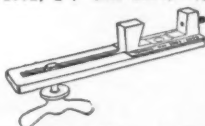
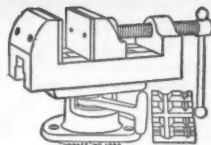
Above is shown "Yankee" Vise and "Yankee" Vise Clamp in use on face plate of drill press. Vise has been removed from swivel base, on bench. Attached to face plate by "Yankee" Vise Clamp, Vise is held securely while holes are drilled. Then, without removal from face plate, Vise is swung into handy position for tapping.



Four Sizes
block, holds rounds. No. 991, 1½" jaw width. No. 992, 2". No. 993, 2¾". No. 994, 4".

No. 993.—"Yankee" Vise. Without Swivel Base. For use on bench, drill press or machine. Sides, bottom, end, accurately machined. V-grooved, steel

No. 1993.—"Yankee" Vise. With Swivel Base. Locks on swivel at any handy position, for marking, filing, fitting. Removable from base, with work held in original alignment for continuous operations on drill press, milling machine, etc. An accurate machine vise, squared all sides. Four sizes: No. 1991, 1½" jaw width. No. 1992, 2". No. 1993, 2¾". No. 1994, 4".



"Yankee" Vise Clamp. Attaches vise to face plate. Made for use only with "Yankee" Vises No. 992, No. 1992, No.

993, No. 1993. Assures rigidity and accuracy, for drilling and machining operations. "Yankee" Clamp permits of shifting work to various positions for tapping, filing and the like, without removal from face plate. Two sizes: No. 2992, length 9¾", is for "Yankee" Vise No. 992 or No. 1992. No. 2993, 10½", for Vise No. 993 or No. 1993.

Order from your Supply House. For "Yankee" Tool Book, write North Bros. Mfg. Co., Dept. MS., Philadelphia, U. S. A.

"YANKEE"

SCREW-DRIVERS, DRILLS, VISES... SAVE TIME AND LABOR

The Jury of Award

The Jury of Award will be drawn from members of the Department of Electrical Engineering of The Ohio State University and any others selected by the Chairman of the Jury of Award. The Chairman of the Jury of Award will be E. E. Dreese, the head of the Department of Electrical Engineering of The Ohio State University, or, in case of his failure to act, a neutral person selected for the purpose hereof by the Trustees of The James F. Lincoln Arc Welding Foundation. The Jury shall have entire responsibility of determining the relative merits of papers submitted and their decisions will be final. The Jury of Award shall have the right to consult experts or outstanding authorities in the various classifications covered by the Contest to assist them in properly appraising the merits of any papers.

By taking any part in this Con-

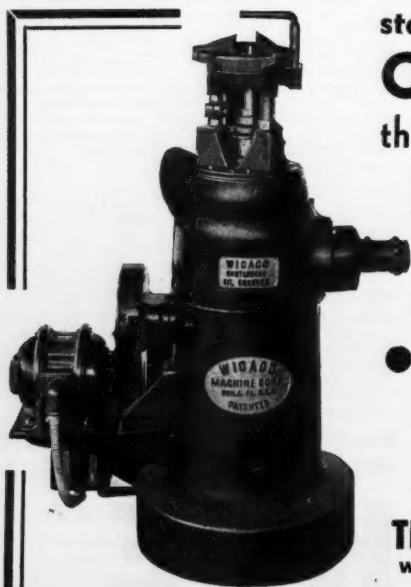
test, the contestant agrees that he shall have and make no claim against the Jury of Award nor any member thereof, nor The James F. Lincoln Arc Welding Foundation, nor the trustees nor depository of The James F. Lincoln Arc Welding Foundation, nor The Lincoln Electric Company, nor any person nor group of persons associated with any of the aforesaid, on account of anything that may be done or omitted to be done hereunder.

Notification of Award

Notification of award will be sent by The James F. Lincoln Arc Welding Foundation to winners in the Contest as soon as the Jury of Award completes its decisions.

Communications Regarding the Contest

All communications relative to the Contest shall be addressed "Secretary The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio."



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WICACO

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Entirely new principles of design and operation in the Wicaco permit loading and unloading without stopping the machine and enable **UNSKILLED LABOR** to produce over 500 pieces per hour.

Tremendous savings and better results are yours if you start now doing your oil grooving with a Wicaco . . . "The Low Cost Way".

Write for Literature or send samples for test runs and estimated grooving costs.

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For All Types of Disc Grinders and All Kinds of Work . . .

Solid and Segmental Types

Plate and Lug Mounted

**Alundum, 19 Alundum, 38 Alundum
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If you are using discs or have a surfacing
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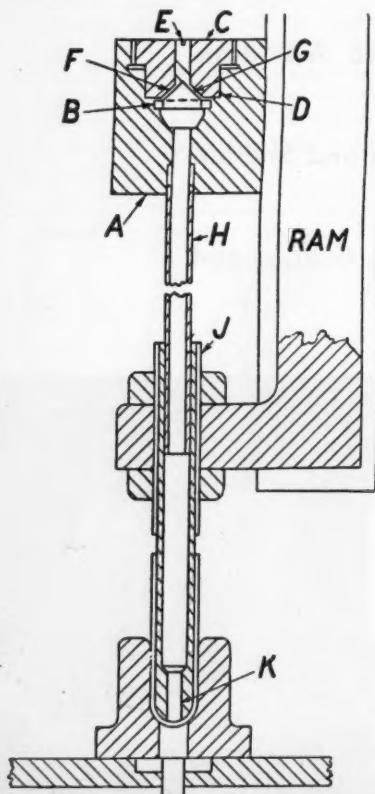
Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Pneumatic Stripper for Necking Press

BY JOHN A. HONEGGER

IN order to obtain the best results from a dial feed necking press in which five necking operations were



Cross Section Drawing Showing Design of Pneumatic Stripper for Necking Press

performed on a shell, it was necessary to arrange a pre-seating punch so that the shell would be definitely seated to the correct depth in the dial bushing before indexing to the first necking position. This precaution was found to be necessary due to the fact that the stationary knockout rods projected out of the necking bushings in the upper side of the press to insure stripping the necked shell at each station, and if at the first station the shell "stuck up" too high, it would be struck and bent by the knockout rod.

In some instances the pre-seating punch would pick up the shell, resulting in smash-ups at the first necking position. To overcome this difficulty, the pneumatic stripping device shown in the illustration was designed.

To the stationary part of the press the block indicated as A was anchored. This block was bored, counterbored, and drilled so that the aluminum flutter valve B could be inserted, after which the plug C was fitted into place. A leather seal at D prevented any leakage around the plug. Through the center of the plug C a hole E was drilled and a conical seat F was machined to correspond to the seat on valve B.

The relation between the valve and the plug was such that when the valve was in the downward position, an air passage was obtained at G. A tube H was inserted into the bottom of the block, and was made to a snug sliding fit in the hollow punch J. At the top of punch J a felt seal and adjustable clamp nut K sealed the con-

Step Up Sawing Speeds, Feeds and Blade Tension

Don't baby your hack saw machine—
get all you can out of it.

**High
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MARVEL

High - Speed - Edge

Hack Saw Blades

Strictly High-Speed, these patented combination blades are also **positively unbreakable**. They permit greatly increased running speeds, for heavier feed pressures, and can be tensioned much tighter than other blades because the hardened "eyes" in their tough alloy steel body will not pull out. No matter what hack saw equipment you use, you can safely run at full capacity with MARVEL High-Speed-Edge Blades.

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Armstrong - Blum Mfg. Co.

"The Hack Saw People"

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**Tough
Alloy
Body**



cam slide

PRECISION ADJUSTMENTS by simply peeling the paper-thin brass laminations from the LAMINUM shim!

Machining, grinding and fitting are saved . . . service adjustments made quickly right at the machine instead of tying up production.

Order through your Mill Supply House

Also a complete line of brass and steel thin shim stock, and arbor spacers.

LAMINATED SHIM COMPANY, INC.
Mfrs. . . . Long Island City, New York

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LAMINUM
Precision adjustment SHIMS

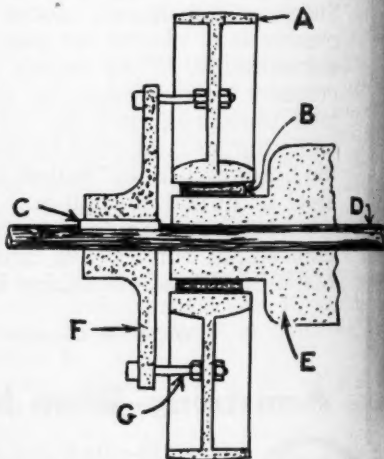
nection between the two sliding members during the entire stroke of the press.

In operation, the flutter valve B opens on the down-stroke of the ram, allowing an inrush of air. On the return stroke, the back pressure of the air closes the valve and holds it shut; thus the trapped air can only escape through the opening K at the bottom of the punch. The area of the bore in the punch plus its total length of stroke was so calculated that a stream of air under high pressure was forced against the bottom of the shell on the upstroke, thus forcing it to remain in the dial bushing and stripping it from the punch.

Eliminating Shaft Deflection

By W. F. SCHAPHORST

AN excellent method of preventing the deflection of a motor shaft and resultant extra wear on the bearings due to the stress of belt pull is



Drawing Illustrating Method of Eliminating Shaft Deflection Due to Belt Pull

illustrated in the accompanying drawing. This method has the advantage that, instead of two additional bear-

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Ex-Cell-O Grinding Spindles



In Ex-Cell-O Grinding Spindles end-play and radial-shake have been almost completely eliminated, with ample freedom provided to permit the high speeds necessary for fine finish and rapid cutting. This is made possible by the use of the famous Ex-Cell-O precision ball bearings, designed and produced for grinding spindle use exclusively. The results are products of extreme accuracy and higher finish at no greater cost!

Ex-Cell-O Grinding Spindles are manufactured for every make of grinding machine and in a size and type, both double body and single body, to meet every production requirement. Send for your copy of the Ex-Cell-O Grinding Spindle Catalog.



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Please send literature on Ex-Cell-O Products as indicated.

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ings, as are sometimes used, only one bearing is required and that is a roller bearing which consumes a minimum amount of power.

To apply this method, the housing E must be turned down, or, if the design of the motor is such that this is impossible, a housing can be cast and attached to the motor as shown. A roller bearing B is then mounted on the hub and the pulley is mounted on the bearing. Thus all the belt pull will fall directly on the shaft housing. The flexible coupling F is keyed to the shaft D and is connected to the pulley A by means of the bolts G, or by other methods familiar to those who use flexible couplings.

The method described not only eliminates deflection of the shaft, but also reduces friction to the minimum. No more space is required than when the pulley is placed — as it often is — on the end of the shaft with the consequent and undesirable overhang.

All the force imparted to the shaft is in the form of torque. The only bending stress is that caused by the weight of the shaft itself, plus whatever the shaft supports. The first cost of the arrangement described may be greater than the simpler method, but in many instances first cost is of small importance compared to space and power saving.

Saving An Undersize Job

By H. S. RICKENBACH

THE "shop kink" described here and illustrated in the accompanying drawing is one that saved the day for us on a special steel forging that had been spoiled in the making. The forging had been ordered for a rush job, and was to be made large enough so that it could be turned to a finish diameter of 6 inches and bored to 4½ inches. When it arrived, we found that it was but 6 inches in diameter in the

CENTRALIZED ACCURACY ASSURED by McCROSKY Centralizing "V" Lock

Blocks
Hardened
to resist
wear and
damage



Bulletin No. 15-B

Gives full details of standard McCrosky Blocks and Bars and shows many examples of special adaptations. Send for a copy.

Adjustable Block Boring Bars
McCrosky Tool Corporation, Meadville, Pa.

CUT TOOL COSTS 20% to 60%

LET THE NATIONAL TOOL SALVAGE CO.



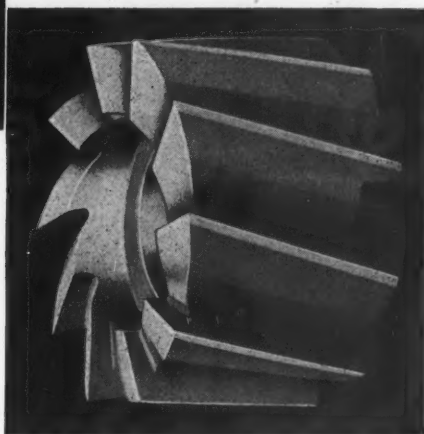
BEFORE

Here's a typical example of economy through tool salvaging by the modern, highly developed N. T. S. method. The Shell End Mill, 3"x3", shown above, costs new \$12.24 net. The recut tool, 2 3/4"x2 3/4", shown at right, costs new \$10.14 net. Reclaiming by the N. T. S. method costs only \$5.07—a saving of \$5.07 (50%)!

Hundreds of the largest tool users are taking advantage of the outstanding savings, greater efficiency and higher production that are possible with sharp, accurate tools reclaimed by NATIONAL TOOL SALVAGE COMPANY.

SALVAGE Your WORN AND BROKEN TOOLS

Every tool, cutter, etc., reclaimed by N. T. S. is fully guaranteed to be as good as when new!



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Send a trial order today—we pay shipping charges one way. Also write for our 18 page illustrated catalog.

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TOOL SALVAGE IS TOOL ECONOMY

Your brand-new automatic screw machine is not completely modern unless it is equipped with

SUTTON DIAMOND-GRIP COLLETS



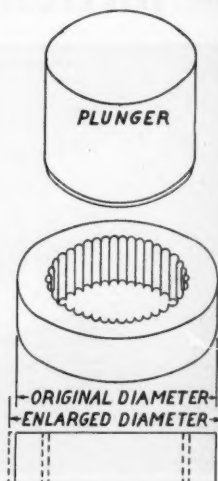
Because they are **DIAMOND-SERRATED**, they grip tighter under less tension, cause less wear on both machine and collet, reduce spoilage.

Modernize by specifying "Sutton Only." Single-piece and master types for all makes of machines.

WRITE FOR COMPLETE CATALOG
SUTTON TOOL COMPANY
2838 W. Grand Blvd., Detroit, Mich.

rough. The piece was $1\frac{1}{2}$ inches thick.

We laid out and drilled a series of holes all the way around inside of a $4\frac{1}{4}$ -inch circle, and pushed the core thus made out of the hole. We then took a short piece of cold rolled steel, 4 inches in diameter, and beveled the



Drawing illustrating method of enlarging a cylindrical forging

end to a 45-degree angle back to a distance far enough so that it could be entered into the hole.

The ring was then placed on blocks in the hydraulic press, the beveled end of the round steel piece was placed in the hole, and a pressure of 80 tons was applied to push the round piece through the forging. When the task was completed, the forging measured $6\frac{3}{16}$ inches diameter, which was sufficient so that it could be machined to the size required.

Handy Clamp-Bolts

By CHAS. H. WILLEY

THE drawing herewith illustrates a type of clamp-bolt which has been found very handy in our shop.

March, 1937

NICHOLSON FILE COMPANY PRESENTS COMPARATIVE TESTS

BLACK AREAS represent units of work completed by competing files

NICHOLSON



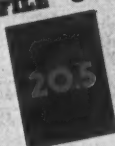
FILE "A"



FILE "B"



FILE "C"



TEST CONDITIONS

All files are 12" flat files and all were tested on high carbon steel. Tests made by hand. Same number of strokes.

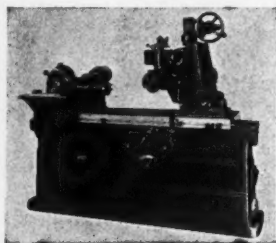
Here's what happened when our new style files were matched against old style files. Our new files completed 30 units of work against 25.0 units, 23.6 units and 20.5 units for competitors.

If you would like files that will remove more work, speed up production and save you money, use the New Nicholson, Black Diamond and McCaffrey Files.

Made on a new principle of tooth construction that has set new standards of file performance. At hardware wholesalers' and mill supply dealers'. Nicholson File Company, Providence, R. I., U. S. A.

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FILE FOR EVERY PURPOSE



Let Us

**GRIND
YOUR
SPLINE
SHAFTS**

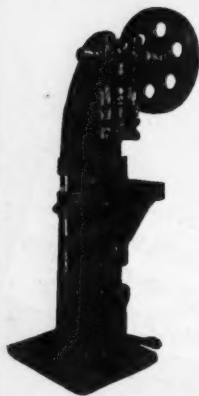
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Type B Spline Grinder.

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Up-to-date
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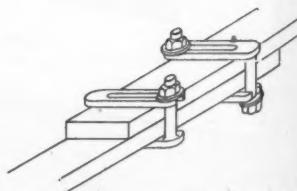
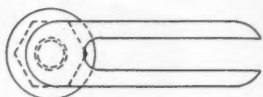
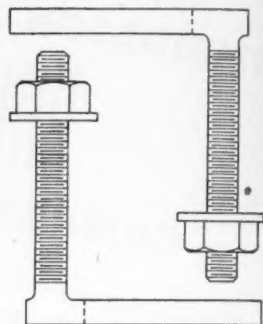
Manufactured by

Zeh & Hahnemann Co.

184 Vanderpool St.

Newark, N. J.

The clamps were, of course, made in the blacksmith department, being forged from a good grade of machine steel. Clamp-bolts of this type will have an unlimited number of uses on



Combination Clamp-Bolts

the drill press, planer, or boring mill. As shown in the drawing, they are used in pairs, each piece providing both a clamp and a bolt.

Speeding-Up a Large Press for a Small Job

By C. R. WHITEHOUSE

WHILE visiting a large job shop recently, I saw a "kink" that I believe will be appreciated by many of the readers of MODERN MACHINE SHOP. I have seen methods devised to meet this same problem

New York

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**THERE IS A
DIFFERENCE**

It shows up

**IN
CUTTING SPEED**

● Not only cutting speed, but *safe* cutting speed plays a large part in your small tool satisfaction. The ability of Morse Tools to maintain high cutting speeds safely and economically is one of the reasons why production and shop men everywhere say "there is a difference."

What assures this difference in Morse Tools? Years of experience in the making of precision cutting tools put one extra value behind the Morse trade mark. Another results from carefully controlled hardening, another from exceptional accuracy in grinding. Step-by-step inspection adds its part.

Next time you hear someone say that all leading metal-removing tools are alike, tell him to try Morse Tools. Tell him it will be worth his while in lower costs and better work to prove to himself "there is a difference."

A conveniently located Morse Distributor assures prompt service.

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TWIST DRILL & MACHINE COMPANY
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Press

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problem

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before, but never in such a simple and inexpensive manner.

A large job of making punchings was contracted for, and it was found that the parts were of such size that the only press in the shop big enough to take the die set was a huge drawing press, the speed of which was so slow that all profit on the job would be wiped out. The only solution lay in somehow increasing the speed of the press, which was done as follows:

From $\frac{1}{8}$ -in. steel stock of a width to correspond to the width of the belt a rim, or tire, was made, just large enough in diameter to slip over the back gear. When in position on the gear, the ends of the tire were welded together and in this way the tire was made a fit on the gear. The belt was then slipped over the tire instead of the usual pulley, with the result that the ram operated at the speed which is usual on a much smaller press. When the job was completed, the tire

was cut away with a hacksaw and the press was returned to its normal condition. No damage was done to the press, and the job was completed with an extra expenditure of only eighteen dollars.

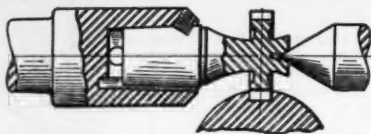
Pheoli 1937 Catalog. Pheoli Manufacturing Company, 5702 Roosevelt Rd., Chicago, Ill., is now distributing a 108-page catalog containing specifications and prices on the screws, bolts, nuts, and related items marketed by this firm, in addition to a variety of special products. The completeness of the line of threaded products is indicated by the visible index to the catalog. The special products illustrated are a few of the many that are manufactured by this firm and are presented to show the diversification in head, shoulder and collar formation and the applications of such operations as pressing, trimming, slotting, pointing, drilling, knurling, and so on. The book also contains tables of American Standard screw thread specifications, dimension tables, weight tables, and other practical and authoritative information. Copy free upon request.

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**TAPER AND
PIN DRIVE—EXTENDED CENTER**

Midwest tested
taper and pin
drive plus lock
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and Extended
Center provide
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Write for free copy of Steel User's Data Sheets, containing valuable information on use and treatment of steel.



Over the Editor's Desk

Our New Address

THE entire business and editorial offices of this magazine have been moved from our former location to 431 Main St., Cincinnati, Ohio. Our readers and clients are cordially invited to call on us whenever they are in the vicinity.

How Much to Make a Job?

THAT question was answered so ably in a recent issue of the Charles L. Jarvis Company's house organ, "The Jarvis Bias," that we feel that the answer should be passed on. Here it is:

"It would be interesting to know just how many thousands of dollars are required to enable, say, a weaver to work in the average textile plant. It costs the Ford Motor Company \$9,007.37. That is just the cost of the land, tools, materials, supplies, taxes, power, and all the other countless things that must be figured in. Each employee calls for that investment.

"What are the returns from that investment of \$9,007.37? W. J. Cameron of the Ford Company says that the total sales divided by the number of employees amounted to \$6,979.49 per employee. But what does that mean? Does it mean profit to the stockholders? Not at all.

"Fully 94 per cent of it has gone for wages and materials, and after taxes and depreciation were paid, one and one-half per cent remained for the Company. That is; out of every dollar of income from sales in the year ending September 30, their own and other employees received 94 cents, and the Ford Motor Company received 1½ cents. Or, one whole year's operation of the average job paid \$1,468.85 to the employee who operated it, and

paid \$111 to the company that invested \$9,000 to establish and maintain it.

"For your own amusement, go ahead now and find out what figures would tell the story of the average plant, of your own plant. But be sure to get all the figures, so that you will know all the costs."

Employee Cooperation Is Important

A WIDOW with two small children—Mrs. Sophia Baikusis—started work in the General Electric plant at Schenectady twelve years ago following the death of her husband. In the twelve years she has offered no less than 89 suggestions for improving manufacturing methods, 54 of which have been adopted by the company. For each of the 54 accepted suggestions Mrs. Baikusis received a cash award under the company's suggestion system, and for being the company's best woman suggester she has now received the Coffin Foundation award.

Another to receive an award was Miss Dorothy Short, employed as comptometer operator in the payroll department of the Schenectady Works since her graduation from high school two years ago. Last October she showed the company how she could increase the output of a checkwriting machine 60 percent, which was 50 percent more than claimed by the manufacturer of the machine.

The employer who has not provided an avenue whereby he can obtain the fullest cooperation of his employees is overlooking a good bet. Often an employee can offer a suggestion overlooked by the management—which will save the company hundreds of dollars a year. With the right system in operation and a worthwhile incentive offered, the results are often surprising.

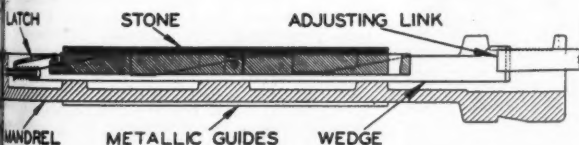
The New SUNNEN PRECISION HONING MACHINE

A fast, accurate method of sizing and finishing small holes from .480" to 2.400" in diameter and up to 7" in length in any material except lead or babbitt. Can be set up for any job in one minute. Cutting pressure controlled through foot pedal. Micrometer stop prevents grinding oversize and makes it easy to duplicate sizes. Particularly adapted for salvage, small run production, assembly, tool room and experimental work.



Price Only \$95

Plus Mandrels, Stones, etc., desired.

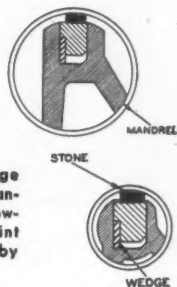


The SUNNEN MANDREL and EXPANDING STONE

See cross section drawings above and at the right showing the design of the Sunnen mandrel with its expanding stone. Notice how the wedge supports and raises the stone—keeping it rigid and absolutely parallel to the center line of the mandrel. It is this patented design that makes possible the unusual accuracy of the Sunnen Precision Honing Machine.

SUNNEN PRODUCTS COMPANY

333 Manchester Avenue
St. Louis, Missouri
Batham, Ontario



End view of large and small size mandrels and stone showing the three-point contact afforded by this design.

FREE Write for free folder giving complete information on this new, valuable piece of equipment. At the same time tell us about any grinding problem you have—giving us the size of the hole, the kind of metal, amount of stock to be removed and your tolerances. If possible send along a print. We'll gladly tell you just what this machine will do for you.

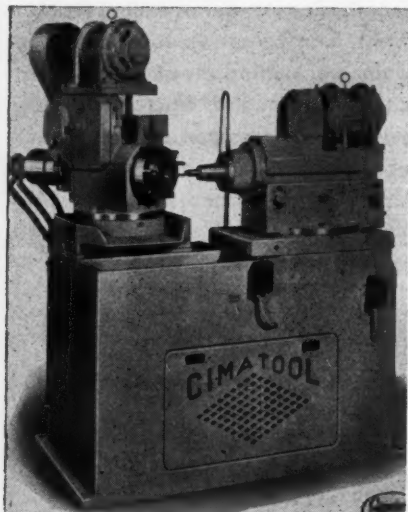
SUNNEN

ONLY WITH ABRASIVES IS IT POSSIBLE TO PRODUCE SMOOTH ACCURATE SURFACES.

New Shop Equipment

Cimatool High Speed Gear Chamfering Machine

The Cimatool Company, June and Third Sts., Dayton, Ohio, announces a high speed gear chamfering machine available in three different models, and providing production speeds on chamfering and burring, ranging as high as 600 teeth per minute. The three types are known as model 4-A, 4-B, and 4-C,



Model 4-A Cimatool High Speed Gear Chamfering Machine

and are available either for air, hydraulic, or manual operation. These machines utilize hollow mill cutters and the cutter heads are provided with rapid traverse to and from cutting position. During the cutting period the spindles rotate while locating against an adjustable backstop in a stationary position.

The 4-A is the smallest type, comprised of a single work head and a single cutter spindle in one base. The 4-B model has a single work head with two cutter spindles, both designed to simultaneously machine a single part.

The 4-C comprises really two 4-A machines in a single base, or two complete single spindle machines in one base.

On the 4-A, the teeth on one face of the gear can be chamfered. On the 4-B, inner and outer faces of a ring or bevel gear may be chamfered simultaneously or the two cutter spindles may machine similar gear teeth on the same face of the gear from opposite sides of the gear, so that one half revolution of the part will accomplish the complete chamfering of one face of the gear. The 4-C model, combining two of the single spindle machines, enables one operator to load one part on one work head while the other half of the machine is operating on another part, thus providing efficiency and saving down time. Two different gears may be handled by the same operator on this machine and it is particularly adapted to efficiently machining a sequence of two different chamfering operations on the same or different gears on the same part.

The work head of the machine not only indexes the part, but also feeds it to the cutter. The indexing action is accomplished by an ingenious mechanism providing the smooth action of a worm and worm wheel, together with a constant mesh index, which eliminates ratchets, loose dogs, and so on, and instead provides a positive mechanical arrangement. The result is a velvet-smooth indexing, involving a slow start at the beginning, together with a rapid interval, and then a slow stop at the end of the index. So-called index plates are eliminated and neither can teeth be skipped, nor, after initial set-up can the machine get out of time.

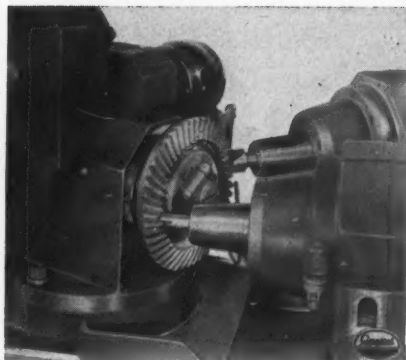
Synchronized with this indexing action is the cam mechanism, which has no bearing on the shape of the chamfer itself, but purely serves to provide an in-and-out reciprocating action which presents the work to and from the cutter. The shape of the cam can, of course, be varied to provide ideal cutting feeds. The work spindle, on which the part is mounted, is a triangular piece of cast, heat treated alloy, providing a wear resisting surface, and the female part in which it reciprocates has an adjustable gib in its base portion for wear take-up.

So that there will be no cocking ac-

tion in connection with the reciproca-
tion, a pair of springs is provided on
each side, which assure a balancing
pressure on the reciprocating work spin-
dle, as well as a cushioning effect. This
means of combining the indexing mech-
anism as well as the action of present-
ing the work to and from the cutter
in the same work head results in a
cleaner, simpler design, elimination of
all universal joints, flexible shafts and
many other unsatisfactory points of
wear. Incidentally, throughout the en-
tire machine all points of possible wear
are provided with take-up adjustments.
The work head is further made a self-
contained, independent unit by separate
standard motor drive, utilizing V belts
and pulleys which are readily changed
when speed changes are desirable.

Precision tapered roller bearings are
standard equipment. The work head
may be rotated through 360 deg., and
overalls are provided giving adjustment
lengthwise and endwise in a horizontal
plane to assure any type of set-up de-
sired. A self-contained lubricating
pump is manufactured integral with the
work head and deep oil reservoir in the
head forces oil under pressure to all
work head bearings. Clamping of the
work may be undertaken manually or
mechanically through the use of hy-
draulic or air operated controls.

The cutter head, of rugged, substan-

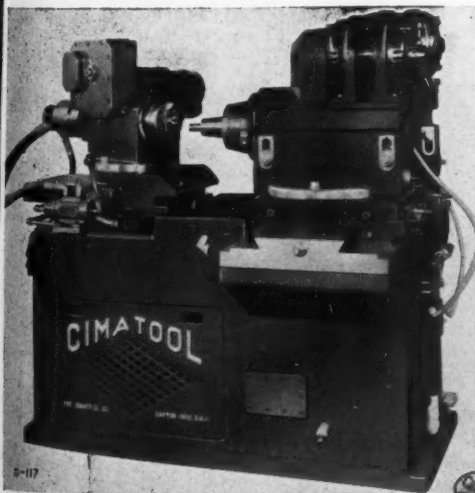


Work-Head on Model 4-B Cimatool Gear-
Chamfering Machine

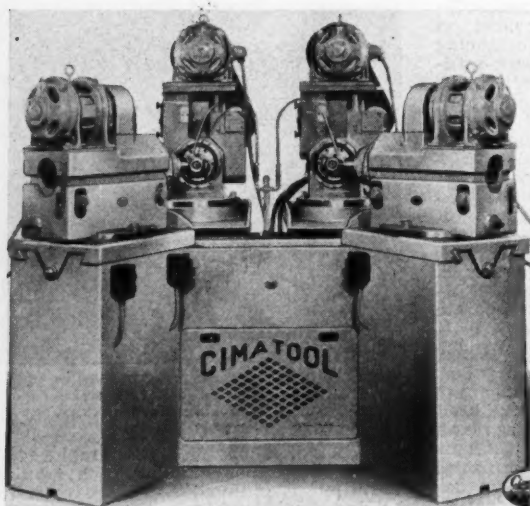
tial design, is provided with rapid tra-
verse, and either manual or hydraulic
operation is optional for quick traverse
to and from cutting position. An ad-
justable positive stop provides a locating
position for the cutter spindle during
the work cycle. Precision tapered roller
bearings are standard equipment. A
heavy balanced flywheel provides addi-
tional smoothness of cut while a stand-
ard motor mounting, together with V
belts and pulleys provides a rapid and
independent means of quickly
varying cutting speeds.

The cutter is provided with
a quick adjustment for raising
or lowering to facilitate off-
center chamfering or other-
wise difficult set-ups. Cutters
are held by quick-acting collet
and a cutter back-stop is
optional. The cutter head may
be swivelled through 360 deg.,
and is adjustable sidewise and
front and rear to further
facilitate ideal set-up condi-
tions. A built-in coolant sys-
tem provides the cutters with
an ample supply at all times.
Careful thought has been given
the problem of chip removal
and easily cleanable, but sub-
stantial, chip baskets are
standard equipment in the
trough or table of the machine.

Tooling for any given gear
is comparatively simple in that
shape of chamfer is largely
taken care of by cutter design
and insofar as machine set-up
is concerned, the only require-
ments comprise the customary



The Model 4-B has a single work head with two cutter
spindles.



The Model 4-C machine comprises two Model 4-A machines on a single base.

adapter as well as a worm wheel having the same number of teeth as the part to be chamfered, so that neither pitch, diameter of gear, or shape of chamfer need effect it.

The work cycle may be completely hand operated, or, optional at additional cost, a completely automatic cycle is obtainable. In this latter case, a time mechanism is furnished as an integral part of the machine, enabling the operator to press a button which automatically actuates clamping of the work, the quick traversing of the cutter spindle to the cutting position, the indexing of the part, and its presentation of the cutter by the work head, the receding of the cutter head to the loading position upon completion of the machining of the part, the automatic shut-off of the machine operation, and the releasing of the work by the clamping adapter. This entire automatic cycle is of course provided with full safety features, assuring rapid, efficient operation, with complete protection for the machine and worker.

Heavy and rugged in con-

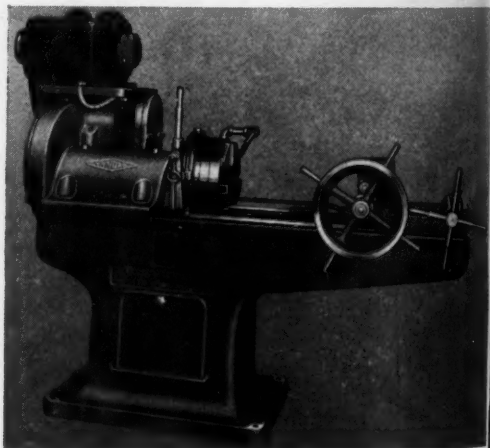
struction, this new Cima-tool machine is provided with sufficient capacity to assure a wide margin of safety on the most demanding jobs. It makes possible the unmatched high production of accurately chamfered gears.

Improved Landis 2-In. Threading Machine

An improved design of the Landis 2-In. Threading Machine is now being marketed by the Landis Machine Company, Waynesboro, Pa. Improvements apply to both the belt and motor driven machines. Instead of using a cone pulley, power is delivered to the belt driven machine through tight and loose pulleys mounted on the main drive shaft to be driven directly from a line shaft and without a countershaft. A belt shifter is provided for starting and stopping the machines. In-

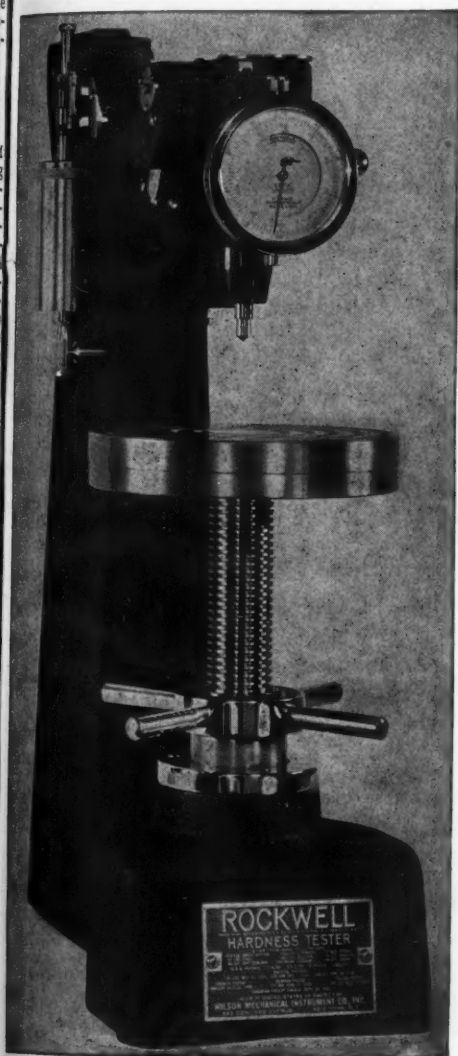
stead of using a cone pulley, power is delivered to the belt driven machine.

Speed changes are effected through a pick-off gear box conveniently located on the headstock. The machine is regularly supplied with gears to cover a range of 31 to 118 r.p.m. With the exception of the lowest two speeds, each



Improved Landis 2-In. Threading Machine

Avoid Interdepartmental Friction



When by hardness test inspection you cull the defective parts or reject unsuitable raw stock, you do a lot toward the smooth running of your own organization. When defective parts get through to be found later in assembly or in service, your assembly and sales department lose confidence in your heat treating. That makes for bickering, hard feeling and waste of time in arguments and discussions. Most men just naturally like to do good work and others try to do good work to protect their jobs—they both need the equipment that will help them serve you.

WILSON

MECHANICAL INSTRUMENT CO. INC.

Concord Ave. & E. 143rd St.,
New York, N. Y.

The "ROCKWELL" Hardness Tester is a friction eliminator in thousands of plants.

set of gears will provide two speeds by reversing the gears. A speed change plate is attached to the gear box showing the proper gears for the various speeds.

The motor-driven machine, illustrated in the accompanying photograph, shows the motor mounted on a plate attached to the top of the headstock. The motor is connected to the gear box by a silent chain drive, assuring a smooth and powerful drive.

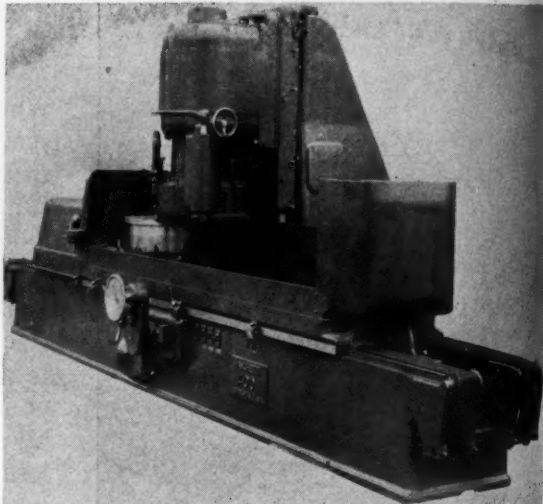
The bed of the machine has been strengthened by making it thicker and adding more and heavier reinforcing webs. The headstock is mounted directly on top of the bed, adding to the rigidity of the machine. The coolant pump is mounted close to the bed avoiding overhang and interference with floor space.

The 2-In. Landis Threading Machine is furnished with either the Landis standard rotary die head or the heat-treated Lanco head. The machine is equipped with the same efficient carriage and vise. It can be furnished either with or without a leadscrew. While the machine is slightly heavier than the old machine it requires practically the same floor space.

No. 400 Series Hanchett Vertical Spindle Surface Grinder

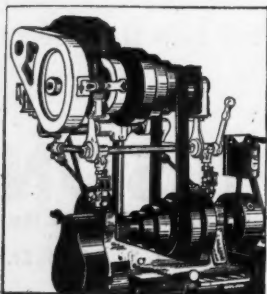
The machine shown in the illustration, product of Hanchett Manufactur-

ing Company, Big Rapids, Mich., is known as the No. 400 Series Hanchett Vertical Spindle Surface Grinder. The machine is built in all lengths from 50 to 132 in. and is hydraulically operated by means of a pressure pump, cylinders and pistons which provide speeds up to 90 ft. per minute. The grinding wheel



No. 400 Series Hanchett Vertical Spindle Surface Grinder

head is provided with hand, power and automatic feeds. The grinding wheel is 22x4x2 in. and is available in either the cylindrical or segmental type. The table top is 18 in. wide by any required length and is provided with T-slots. Power is provided by a built-in type 30 h.p., 700 r.p.m. motor. A 40 h.p. motor is also available. Equipment includes patented belt covers for the table ways.



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Remco Motor Drives deliver power when, and where, it is needed. Show production increases up to 100%, with power savings up to 50%. Eliminate costly maintenance of shafting, pulleys, clutches and belting. Improve lighting! Increase safety! Reduce noise! Save floor space! Low installation cost! Big savings! Investigate — write! Manley Products Corp., State & Hay Sts., York, Pa.

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on COLD DRAWN STEELS

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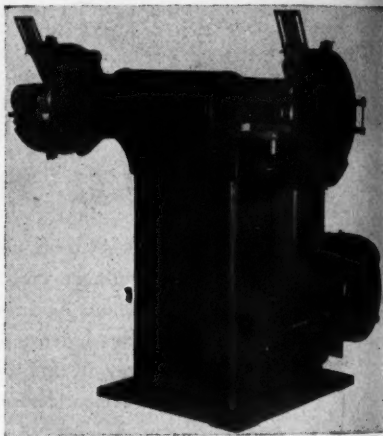
Name

Address

The illustration shows at one end of the table a power driven 24-in. diameter rotating magnetic chuck, which is driven by a separate motor through a variable speed unit. The chuck can readily be removed so that a rectangular chuck or fixtures can be applied to the table in the usual manner. The machine is provided with a wheel dressing device as well as a motor driven coolant system with coolant tank of more than ordinary capacity. The weight of the machine with all equipment in the 86-in. length is 25,000 pounds.

Production Type 300 Grinder

The Production Type 300 Grinder shown in the illustration, a recent addition to the line of grinders and buffers built by The Production Equipment Company, 5219 Chester Ave., Cleveland.



Production Type 300 Grinder

Ohio, is of the overhung selective speed type. It is similar to the Type 300 buffer, except it is built for grinding duty. The head casting is split, allowing easy removal of the spindle and bearing sleeves as a unit. The head casting and caps are assembled, and then bored for accurate alignment of the spindle bearing sleeves. The sleeves, which contain the heavy duty spindle bearings, are furnished with end castings, and form sealed oil reservoirs of large capacity. Filler, level, and drain are furnished for each sleeve.

The spindle, built of high carbon steel, is of liberal size and is furnished

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a copy of the new
**WRIGHT
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● Just about every bit of information you would want to know about chain hoists or hand operated hoisting equipment is given in the new Wright Hoist Catalog—a book packed with hoisting facts and loading data.

When you get your copy of this new Catalog, check the Wright 21 Points. Compare them with hoists you are using—or any other hoists. Examine the engi-

neering section—Pages 80 to 84 inclusive—a reliable encyclopedia on permissible loads under various conditions and requirements.

Every factory manager, superintendent and foreman will find much useful information and data about choosing, operating and maintaining hoists in the new Wright Catalog. Send for it—you'll receive your copy at once.



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In Business for Your Safety

WRIGHT *Improved High Speed* **HOISTS**

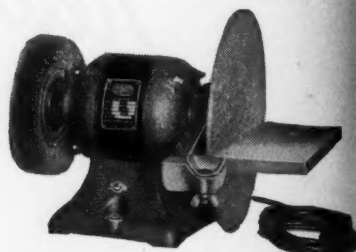
with flanges and nuts. Wheel guards are of the safety type, built of steel, and are adjustable to wheel wear and location of grinding opening. They are supplied with hinged covers, exhaust connection, and spark shields. The ball bearing motor is mounted at the rear of the machine, on a pivoted base which allows for belt stretch. The drive from the motor to the spindle is V belt and is enclosed by a guard.

The starter is of the magnetic type with overload and no voltage protection. The start-stop push button is located on the front of the machine. Motors are furnished in either enclosed fan cooled, or semi-enclosed designs. Distance between inside of wheels is approximately 41 in. This type of machine allows proper spindle speeds for maximum wheel efficiency. When furnished with quick change sheaves it permits the wear of wheels to small diameters, maintaining proper cutting speeds at all times.

Chelsea 12-In. Disc Grinder and Sander

A complete grinder, sander and buffer of wide construction, free operating facilities, and with accessibility for

grinding and sanding large and odd-shaped pieces has been brought out by Chelsea Fan & Blower Company, Inc., 370 W. 15th St., New York, N. Y. The



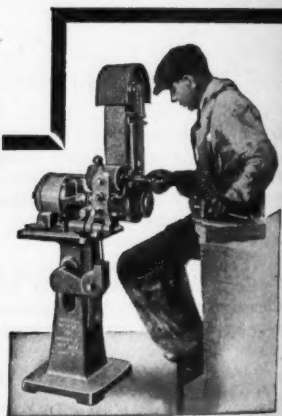
Chelsea 12-In. Disc Grinder and Sander

machine is equipped with a tool rest and adjustable table which are accurately fitted and properly located. The disc is 12 in. in diameter and is faced with No. 50 Grit Carborundum Aloxite Cloth Disc. An extra threaded shaft is furnished so that a grinding or buffing wheel can be applied to the opposite end. The grinding unit is equipped with a 10-ampere on-and-off switch, 10 ft. of cord and a rubber safety plug.

4 MACHINES FOR THE PRICE OF 1

The Production Polisher and Surfacer is a machine of many uses. It combines—a Centerless Feed Polishing Machine—a Vertical or Horizontal Belt Grinder—Surfacers or Polisher—an Internal Grinder or Polisher. For cylindrical polishing and straight line finishing on flat work, it has no equal. Suitable for metal, rubber, fibre, wood, or anything that can be ground or polished.

Write for complete information on the Type S Production Polishing Machine.



IT'S A "HANDY"
MACHINE

PRODUCTION MACHINE CO., Greenfield, Mass.

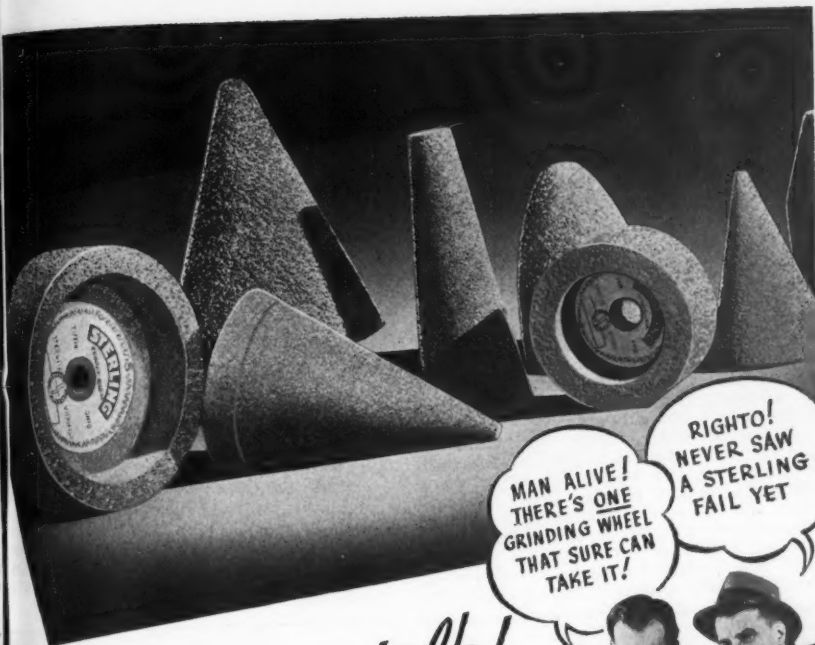
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high speed use.

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• When STERLING PORTABLE WHEELS are put on your portable grinder, production really moves. For many years STERLING wheels have been favorably discussed when grinding wheel users get together. Their ability to give and take, their consistent good production, their uniform life have all come into the discussion with results that give us the right to say—
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Abrasive Division of The Cleveland Quarries Co.

STERLING ABRASIVES

The grinder is designed for a variety of operations. Wire scratch wheels or cloth buffing wheels can be used when required. The sander is said to be excellent for grinding lathe tool bits at accurate angles. It is also especially adaptable for pattern makers. Power is supplied through a 1/3 h.p., 1750 r.p.m. ball bearing motor. The bearings are well protected to prevent dirt and grit from entering.

Miller Standard Arc Welder

To supplement the line of portable arc welders which comprise the product of the Miller Electric Mfg. Company, Appleton, Wis., this firm has brought out a light weight, low priced transformer-type welder under the trade name "Miller Standard Arc". The welder is made in four models of capacities from 130 to 300 amperes.

Equipped with rotary knife switch control with amperage marked for each welding step, the welders have the same efficiency as the regular Miller welders. They are lighter in weight only because the cabinet is of wood and because there are less amperage controls than are used with the regular welders. The welders are especially designed transformer-type

without reactance control or sheet metal attachment. They are said to be easy and safe to operate, and can be used for



Miller Standard Arc Transformer-Type Welder

welding on grounded surfaces without danger to the operator due to the fact that they are not "auto" transformer-type welders.

GUARANTEED LEAK-PROOF

The momentary contact double solenoid high speed valve shown at right is only one of hundreds of Q. A. W. combinations available for practically

any requirement of air control. For this purpose Q. A. W. offers the most complete line in the world and every valve is unconditionally guaranteed against leakage.

Q. A. W. just can't hold up production. 50 million operations without inspection is common.

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TEETH THAT BITE!

• Nature gives every wild animal strong, sharp teeth, firmly set, for a lifetime of effective use. Without them they could not survive.

Atkins spent years engineering a perfect set of saw teeth to suit every cutting need in wood, ferrous and non-ferrous metal, plastics or stone. Silver Steel, metallurgy's finest saw steel, assures teeth that will stay sharp longer, hold their set, cut easy, fast and clean. 80 years experience in tooth design, plus Silver Steel, assures maximum production with a minimum of effort. Atkins Saws have the teeth that bite.



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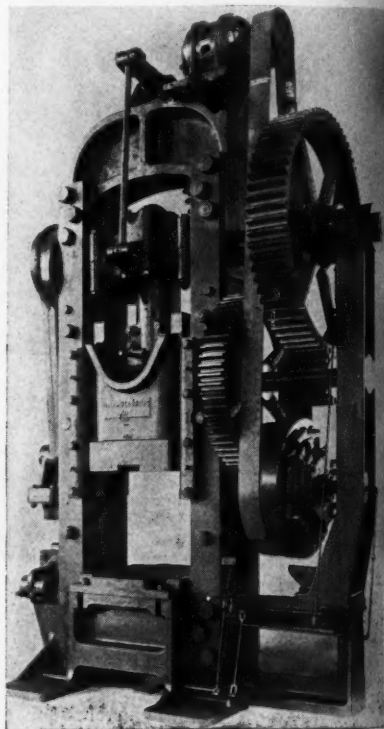
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UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICH.



Chambersburg 300 Ton Double Geared Steel Side Trimming Press

The line of trimming presses made by the Chambersburg Engineering Company, Chambersburg, Pa., has been augmented by the addition of a 300 Ton Double Geared Trimming Press with air oper-



Chambersburg 300 Ton Double Geared Steel Side Trimming Press

ated clutch, illustrated herewith. This machine has the Chambersburg patented forged steel side frame construction, oversize crank, and outboard bearings which characterize all Chambersburg trimming press designs.

The air operated clutch makes the machine extremely easy to control and this feature also automatically provides a safety slip in the event of excessive overload. The reinforced steel sides of the press provide a margin of safety which makes it impossible to break the

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Production . . . down went TOOL COSTS

To get greater production on a difficult punching job, this tool maker turned to his Tool Steel Selector on the wall. He located the type of job and used the recommended tool steel. Production jumped from an average of 32,000 per tool to 179,000. The Tool Steel Selector had helped him solve his problem just as it is doing in a thousand other tool rooms. Write for a free wall size Tool Steel Selector today. It will show you a new, easier way to Better Tools. Mail the coupon.



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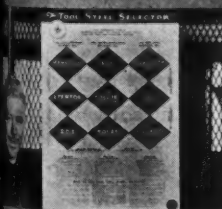
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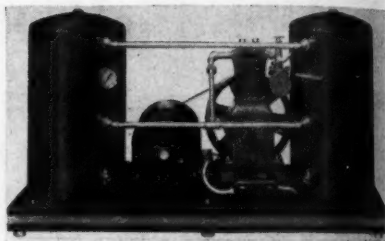
frame of this tool.

The distance between the frames is 40 in. The ram face from left to right is 30 in. and from front to back is 30 in. The bolster, left to right, is 37 in. and front to back is 40 in. The bolster is 5 in. thick. The stroke is 8 in. with a 5 in. adjustment. The machine is powered by a single 20 h.p. constant speed motor. Weight, 68,000 pounds.

Union-C Series No. 200 Air Compressor

The illustration shows the Union-C Series No. 200 Air Compressor which has been placed on the market by Union-C Machine Co., Inc., Union City, N. J. The 200 Series includes six models designed to deliver from 3 to 26 cu. ft. of free air per minute at a constant pressure of 150 lbs. and an intermittent pressure of 200 lbs. The compressor is built on a double steel cork-insulated base with a cork-insulated motor base. The motor on all models is of the ball bearing type, 50 or 60 cycle, A.C. single phase. The power is transmitted from the motor to the compressor by V-belt drive. Control is provided through an independently fused safety switch.

The compressor is of the plate valve



Union-C Series No. 200 Air Compressor

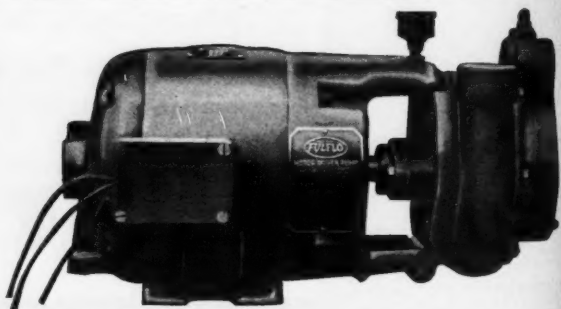
ball bearing type with an intake air cleaner and muffler and automatic pressure control. The tank is electric welded and tested to 400 lbs. The dimensions range from 16x44x23 for the 1/2 h.p. model to 22x70x36 for the 5 h.p. model.

No. 57 Greenerd Hydraulic Press

Greenerd Arbor Press Co., Nashua, N. H., has placed on the market a 6-ton hydraulic press of the punch press type. Unlike the punch press, however, this press may be stopped at any point of



- QUIETNESS
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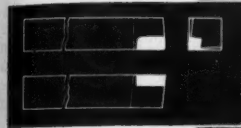
CENTRIFUGAL COOLANT PUMPS

THESE UNITS CAN BE MOUNTED IN ANY POSITION

AG3M.....	1/4 H.P. BALL BEARING MOTOR.....	25 G.P.M.....	10 FT. HEAD
AG4M.....	1/3 H.P. BALL BEARING MOTOR.....	35 G.P.M.....	10 FT. HEAD
AG5M.....	1/2 H.P. BALL BEARING MOTOR.....	50 G.P.M.....	10 FT. HEAD
AG6M.....	3/4 H.P. BALL BEARING MOTOR.....	70 G.P.M.....	10 FT. HEAD

FULFLO SPECIALTIES CO., INC.

BLANCHESTER, OHIO



Tools used in this operation, Vascoloy-Ramet, Grade A for Cast iron, style 6, Tool size $\frac{3}{4}$ " x $\frac{3}{4}$ " x 4", Tip size $\frac{1}{4}$ " x $5\frac{1}{16}$ " x $\frac{5}{8}$ " standard grind.

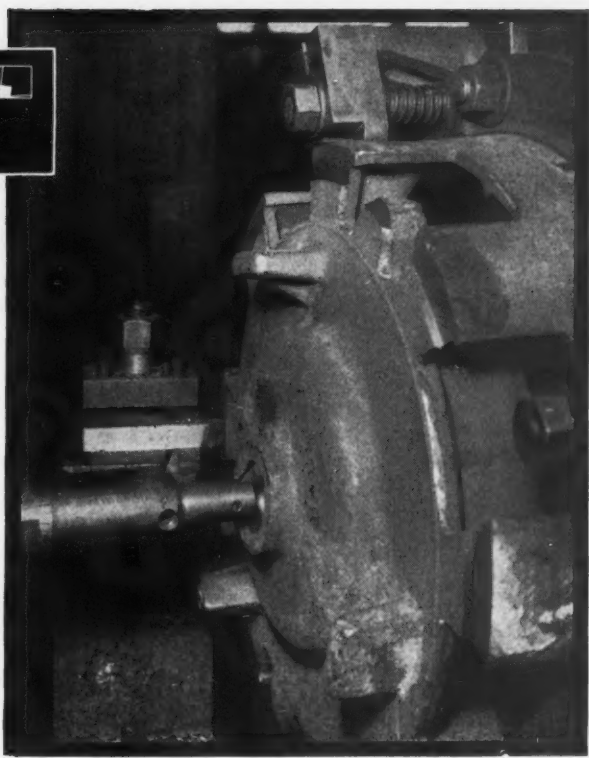
Cast iron and cast iron alloys, semi-steel, brass, bronze, aluminum and aluminum alloys, non-ferrous metals and materials, all steels from the softest to the hardest and toughest alloys — whatever the material there's a Vascoloy-Ramet grade which precisely fits the work in hand.

Produced in 17 standard grades, of different tantalum-carbide content, strength and hardness, Vascoloy-Ramet alone covers the entire range of machinable materials with a grade for every use.

This is why Vascoloy-Ramet is setting new records daily for increased pieces per grind, for faster time from floor to floor, for lowered production costs.

This is the reason for its rapidly increasing acceptance as the preferred tool material, in great industrial plants and in small shops, as well, throughout the country.

The new Vascoloy-Ramet catalog price list will be sent upon request.



Machining Motor Mounting—Material—Cast Iron—Operations $\frac{1}{4}$ " Roughing cut, $1\frac{1}{32}$ " finishing cut, facing $17\frac{1}{8}$ " to 13" intermittent cut—Comparative results with Vascoloy-Ramet Tools, Grade A and High Speed Steel Tools.

TOOLS	FEED	SPEED	Cutting Time	PIECES PER GRIND
Vascoloy-Ramet Grade A	.030"	255 F.P.M.	2 Minutes	100 (complete order)
H. S. Steel	.030"	125 F.P.M.	6 to 8 Min.	6 to 12

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VASCOLOY-RAMET DIVISION,
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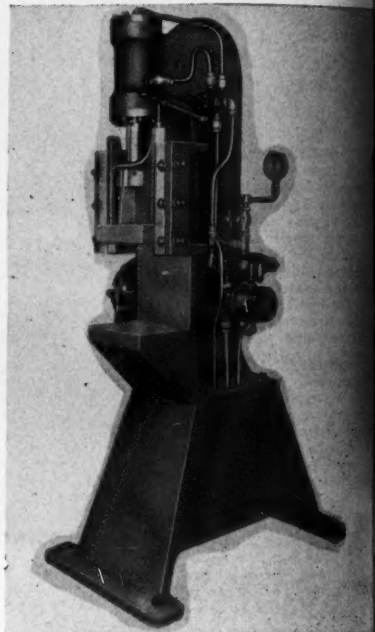
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POUGHKEEPSIE, NEW YORK



the stroke in either direction by the simple operation of a hand lever.

The frame of the No. 57 press is cast of special hydraulic semi-steel and the press is equipped with a steel piston having three cast iron rings and sealed with chevron type packings. The ram is of alloy steel, heat treated and ground. The cross head is machined to fit the steel ways, which are accurately aligned.



No. 57 Greenerd 6-Ton Hydraulic Press

with the ram, and both ways are made adjustable to compensate for wear.

A 3 h.p. motor and pump are mounted on opposite sides of the main housing and the pump is connected between a 20 gal. sump in the base and the control valves—which is operated by hand. At the top of the cross head is a knock-out adjustment by which the length of the return stroke is controlled. The ram is controlled either up or down by a hand lever.

The pressure may be adjusted from $\frac{1}{2}$ ton to 6 tons on the down stroke, the pull on the up stroke being 3 tons. The stroke of the ram is 5 in. and the dimension from the cross head to the platen is 10 in. The length of the cross

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BIG BALL BEARINGS



YES-UP TO 21-INCH BORE !

Rugged giants they are, in their ability to carry loads and stand up to punishing jobs. Yet they have all the PRECISION, the fineness, the friction-free smoothness, of their pigmy brothers in the NORMA-HOFFMANN line. ***

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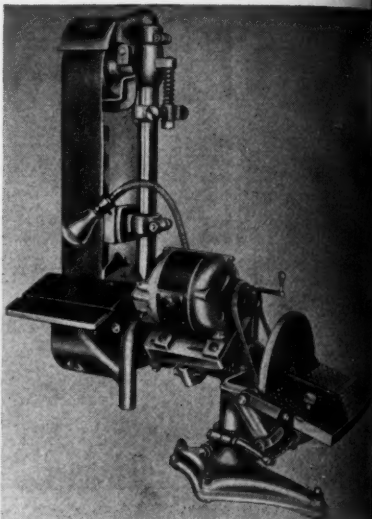
head is 15 in. The bottom of the cross head has a dovetail slot for mounting fixtures.

The ram speed down is 240 in. per minute and up is 336 in. per minute. Diameters up to 10 in. can be accommodated. The working table is 12 in. wide by 8 in. deep and the dimension from center of cross head to back of throat is 5 in. Bottom of cross head, 6½x11 in. The press is supplied complete with 220, 440 or 550 volt, two or three phase, 50 or 60 cycle motor as above, complete with the starter and cross head machined with a dovetail slot to receive fixtures. This press can

be furnished to operate on one complete cycle down and up, or may be otherwise modified to meet special requirements.

Walker-Turner Series 900 Belt and Disc Surfer

The Walker-Turner Co., Inc., 7100 Berckman Street, Plainsfield, N. J., has brought out a metal surfer to be

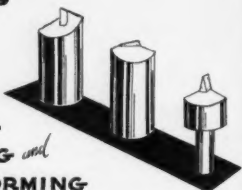


Walker-Turner Series 900 Belt and Disc Surfer in Vertical Position

classified as the "series 900." "Stroke" sanding, which enables the operator to surface large areas up to 36 in. in width of any length, is handled very effectively. In "stroke" surfacing, the work is placed on a table which may be rolled cross-

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for
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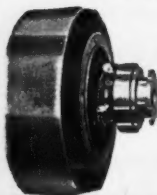
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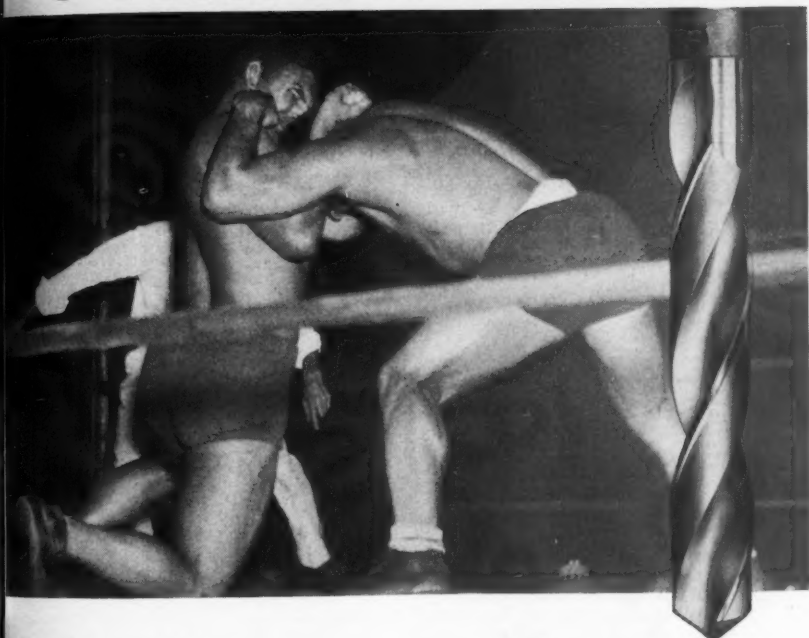
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wise of the abrasive belt. The table and work are moved under the horizontal belt and pressure is applied to the inner surface of the belt by means of a "stoking" block.

For the type of work ordinarily done on the belt sander, there is a table or platen beneath the upper section of the belt. At this point small pieces can be sanded by merely holding them in contact with the moving belt. The whole belt unit can be shifted from a horizontal to a vertical position in one movement.

The disc sander may be used to cut mitered pieces rapidly or slowly depending on the grit, speed, and amount of pressure used.

Integral with the surfer is a complete dust collecting system which removes the dust at both pulleys and from the sanding disc housing. Pulley hoods have individual dampers for controlling the suction.

Stanley No. 124 "Victor" Drill

An electric drill of $\frac{1}{2}$ -in. capacity, to be known as the No. 124 Victor, has been added to the line of electric tools made by Stanley Electric Tool Division, The Stanley Works, New Britain, Conn. The



Stanley No. 124 "Victor" Drill

drill was designed to meet all requirements for either metal or wood drilling.

Features of the No. 124 Victor Drill include specially heat treated nickel steel gears and a universal motor mounted on seal type ball bearings. It has a strong aluminum alloy housing and a three-jaw chuck. A built-in pocket is provided on the housing to hold the chuck



DIRECT WORM DRIVE ELECTRIC HOIST

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Close Headroom
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Improved CENTERLESS GRINDING



IN PRECISION operations such as centerless grinding of king-pins, (pictured), abrasive wheels bonded with Bakelite Resinoid provide the combined advantages of free-cutting, non-burning of work, and

larger output per wheel-dressing. Strong, heat-resistant and cool-running... Bakelite Resinoid bonded wheels operate safely at speeds up to 16,000 s.f.p.m. Write for handbook 47G, "High Speed Abrasive Wheels".

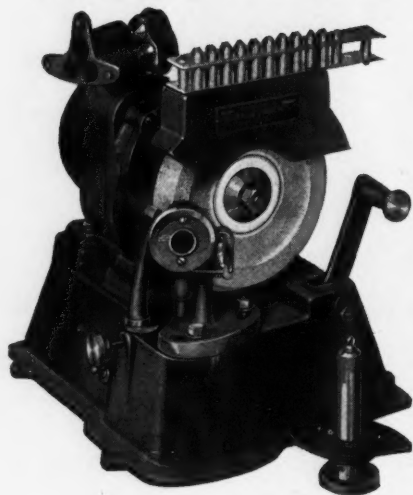
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A money-saving machine for every shop.

Black Diamond Precision Drill Grinders assure accurate and correct grinding on any size drill from No. 60 to $\frac{1}{2}$ inch. No complicated adjustments are necessary. Install one in your shop. You will get simplified, fast and precision drill grinding at an exceptionally low cost.

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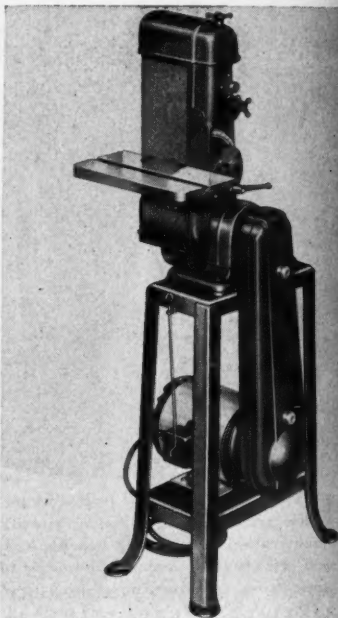
Notick, Mass.

key where it can be located readily. The drill is equipped with a combination speed and breast plate handle and a plug handle that may be detached for working in close quarters. A heavy rubber covered three-wire cable extending from the handle is standard equipment.

The motor is of the universal type operating on either D.C. or A.C. 60 cycle current or less and at 32, 110, 125, 150, 220, 230 or 250 volts as specified. The chuck operates at 500 r.p.m. with no load and 340 r.p.m. under full load. The length overall is $15\frac{1}{2}$ in. and the net weight is $12\frac{1}{2}$ pounds.

Delta 6-In. Belt Surfacers

Designed to handle a wide range of sanding, surfacing and finishing operations, a new 6-in. belt surfacer recently marketed by the Delta Manufacturing



Delta 6-In. Belt Surfacers

Company, 600 E. Vienna Ave., Milwaukee, Wis., has several unique features.

It can be used as either a horizontal or vertical sanding machine for surfacing or shaping wood parts. When in the horizontal position it may be fitted with

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UNIVERSAL JOINT SOCKET WRENCHES and ADAPTERS



For tightening nuts and screws in hard-to-get-at places, Apex wrenches are real time and money saving tools on assembly operations.

Shanks are furnished to fit any size or type of electrical or air tool—also furnished with shanks to fit Yankee Screw Drivers for small assembly work. Sockets are furnished in any length, diameter and broaching to suit the job.

Operates at 35° angle—cannot lock at maximum angle. Tension type wrenches hold sockets in alignment with shank but allows full working angle. For setting nuts or screws in difficult places, this wrench cannot be equalled.

New Sockets quickly assembled when old one wears out.

Noted for their long life and strength.

Apex Adapters, of the same design, are furnished with square or oval shank openings to fit all kinds of extension shanks.

Apex universal joint socket wrenches and adapters will reduce your assembly costs.

We also manufacture a complete line of plain socket wrenches of exceptional quality—a trial will convince you that APEX WRENCHES will reduce your tool costs.

THE APEX MACHINE & TOOL CO.

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Dayton, Ohio

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The Apex Machine & Tool Co.
573 East Third St.
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Mail me without cost your Apex Catalog No. 8 and full information about the tools I have checked below.

Name..... Street.....

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APEX TOOLS:Quick Change Drill Chucks,Morse Taper and Tap, Collets,Close Center Chucks,Positive Drive Chucks,Vertical Float Tapping Chucks,Safety Friction Tapping Chucks,Full Floating Tool Holders,Semi-Floating Tool Holders,Floating Tap Sleeves,Self Releasing Stud Setters,Universal Joints,Universal Joint Socket Wrenches,Plain Socket Wrenches,Screw Drivers,Micro-set Helical Expansion Reamers,Adjustable Blade Hand and Machine Reamers,“X-L” Improved Adjustable Blade Shell and Machine Reamers, Special Line Reamers.

a wood fence and an adjustable back stop to guide and stop the work. In the vertical position it may be fitted with a tilting table that permits a wide variety of angular shaping and sanding.

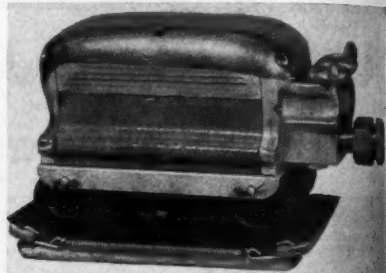
Its versatility enables it to be used not only in the finishing of metal parts with aluminous-oxide and silicon-carbide belts, but also in the surfacing and finishing of parts made of Bakelite, Catalin and other plastics, bone, tile, asbestos and many other materials.

The machine is completely equipped with self-sealed ball bearings, lubricated at the factory for their entire life. The drums carrying the sanding and finishing belts are designed to eliminate the necessity of rubber coverings which require frequent replacement. A distinguishing feature is the complete enclosure of every part of the belt and drive mechanism, which not only makes the machine conform to safety requirements, but also enables an efficient dust-collecting system to be added to it. It may be mounted on a steel stand to make it completely self-contained, if required.

Sterling Speed-Bloc Sander

A new and improved model of the Sterling Speed-Bloc Sander has been

announced by the Sterling Products Company, 2457 Woodward Ave., Detroit, Mich. The new model is air driven, and the weight of the sander has been re-



Sterling Speed-Bloc Sander

duced from 7½ to 5½ lbs. This weight reduction and perfected balance, plus the compact dimensions of 7 in. long by 4¾ in. high and 3¾ in. wide, provide a comfortable fit to the palm of the hand and make the machine extremely responsive to the guidance of the operator.

The Sterling air motor is of original

CANEDY-OTTO

20" Sliding Head Motor Driven Drill For Production or Precision Drilling

Here's another rugged and well-balanced Canedy-Otto Drill—precision built from the ground up to give fast, accurate drilling. Vertical Motor Drive provides simplified construction. Driving units are completely equipped with Timken Roller Bearings, the motor and motor cone pulley with ball bearings, and the spindle cone with roller bearings.

Drills are equipped with push button control and magnetic switch. Desired belt tension is easily obtained with convenient, simple arrangement. Self feed is accurate and powerful. Four changes of feed can be had while drill is operating. Capacity for ⅝" drills without back gear—1¼" with back gear.

Furnished in single, two, three and four spindle type—15¾" center distance of spindles.

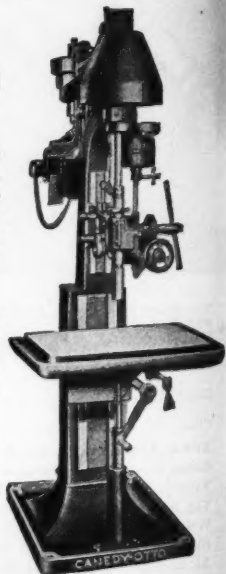
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CANEDY-OTTO MANUFACTURING CO.

CHICAGO HEIGHTS

ILLINOIS



design and is built to the closest tolerances practiced in the machine tool industry. All parts are interchangeable, which facilitates service. The machine operates efficiently on 45 to 60 lbs. of air pressure, using approximately 6 cu. ft. per minute under load. The cam, flywheel and connecting rod are supported on double shielded ball bearings and all moving parts are manufactured of alloy steel, hardened and ground. Pistons are given an "Anodic" treatment.



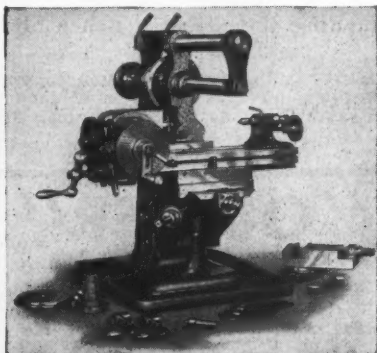
Sterling Speed-Bloc Sander in Operation

For wet work a water connection is provided by which the water hose can be connected to an outlet on either side of the machine which directs a spray of water to the surface being sanded. This manner of designing the water outlet protects the workman from getting wet without the use of baffle plates. For work with naphtha, benzine, and so on, a special block with Sterlite base is provided which is impervious to volatile compounds.

The principle of "Floating" as applied to the construction of the block and pad is an exclusive feature, providing flexibility for sanding and rubbing of both curved and flat surfaces. Special pads, varying in flexibility, have been developed for particular types of surfaces and materials. The sanding action is reciprocal, with $\frac{1}{8}$ in. travel of the pad at

"Stark"

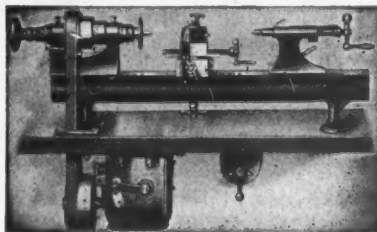
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Spiral and Plain, with Motor Drive Unit or Countershaft.

Ideal for every exacting Laboratory or tool-room work.

Equipped with fast feeds for manufacturing and specially fitted for handiness in operation. Index Centers are by far the closest of any in this small size.



Stark Precision Lathes incorporate every known device for speed and extreme accuracy. 8 Sizes. $\frac{1}{8}$ " to $1\frac{1}{4}$ " collet capacity up to 12" swing.

Spring Bind Heads, Lever Chuck Closer Heads for very fast and accurate production of small exacting parts. Automatic Turret Heads, Diamond Die Tools, Sensitive Drills and Tapping Machines, Chucks, Collets, Special Precision Tools.

STARK TOOL CO.

WALTHAM, MASS.

Originators of the American Bench Lathe

speeds of from 1750 to 3000 complete oscillations per minute, depending upon the application. From one to five sheets of abrasives may be attached to the pad at one loading. Ordinary size sheets are cut into three pieces without waste, each 3-2/3 x 9 inches.

Munding 40-In. Radial Bench Drill Press

Many drilling, reaming and tapping operations on work which is of such a size and shape as to be too small for

large drill presses and yet too cumbersome and awkward to handle efficiently on a small drill press can readily be performed on the Munding 40-In. Sensitive Drill Press, which is now being marketed by Munding Manufacturing Co., 703 E

"OLIVER"

12 - INCH SPEED

LATHE

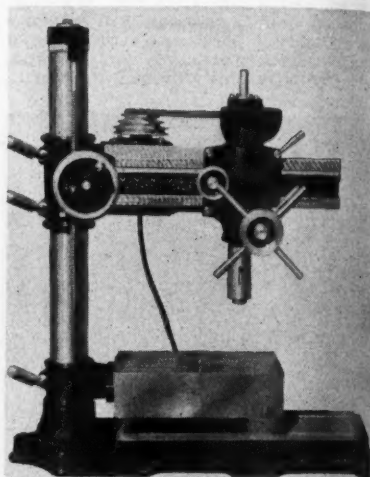


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For finishing, filing, polishing and general utility. Swings 12" diameter over bed, 9 1/4" over carriage. Belt drive or most efficient adjustable speed head-stock built. Bronze bushed end thrust. A quality lathe, but moderately priced.

Write for Illustrated Folder

OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN



Munding 40-In. Radial Bench Drill Press

Colorado Blvd., Glendale, Cal. The drill table is movable and can be swung to locate the drill or tap at any point on the surface of the work, or it can be swung around to operate over the side of the bench.

The height of the column is 38 in. and the length of the base is 36 in. Drill capacity at the end of the arm is 1/2 in.

The tilting table is 10x15 in. and the apron on the tilting table is 4x15 in. Working space on the base is 10x25 in. The vertical travel of the arm on the

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Flexible Shafts and Machines FOR

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Take the best milling machine that money can buy. Put on it a cutter that is less than the best . . . instantly machine performance descends to the cutter level. Profits can be lost, and found, between the work-piece and the machine spindle. Design, materials, workmanship, heat-treatment, finishing, and inspecting are prime factors in cutter manufacture. In Barber-Colman cutters each factor is the best that money can buy or human knowledge, skill, and experience can create. Consequently, if you are now using less than the best, Barber-Colman cutters can improve your milling machine performance, protect your machine-tool investment, increase your net profits. Buy Barber-Colman cutters!



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BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

column is 17 in., and the horizontal travel of the head on the arm is 14 in. Distance from center of column to center of the quill is 22 in. Spindle travel is $6\frac{1}{2}$ in. Four spindle speeds are available; 3000, 2250, 1500 and 750 r.p.m. Motor pulleys for higher or lower speeds can be furnished. The arrangement for changing the belt for different speeds is simple in design and easy to manipulate. By pulling a small knob, the motor is moved forward, thus allowing an easy change of the belt from one groove to another. Pushing the knob back again relocates the motor in driving position.

The spindle sleeve is $2\frac{1}{4}$ -in. diameter and the taper in the quill is Morse No. 2. Distance from quill to top of base, 23 in. Distance from quill to top of table, 17 in. Weight of machine complete, 335 pounds.

Mico Three-Angle Surface Plate

Inasmuch as accurate surfaces and accurate angles are basic tools in shops and laboratories dealing with precision mechanical work, an especially accurate angle plate with dial indicator, microscope, and height gage is now being offered by Mico Instrument Company, Cambridge, Massachusetts.

The top surface of the plate is 9x12 in. and the height is 3 in. The three surfaces are scraped flat to 0.0001 in. and the three angles are 90 deg. within 0.00025 in. in the 12-in. length. This corresponds to an accuracy of about 6 seconds of arc. The plates are thoroughly aged before final scraping to insure permanent surfaces and angles. One of the 3-in. faces can be used as a base with a larger plate to form an accurate right angle member, or flat plates can be clamped to it to build up right angles on its 9x12-in. surface.

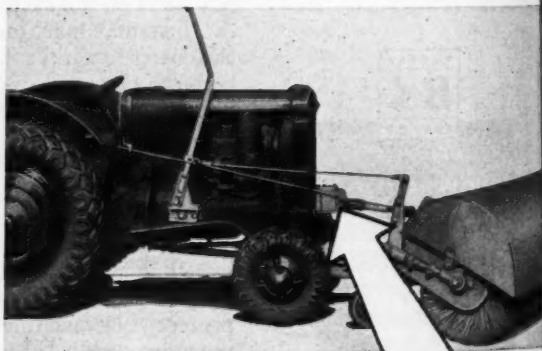
The plate is shown in the illustration with some of its accessories. The microscope permits the viewing of small parts. The vee-rests and centers offer easy methods of assembling parts that are to be checked. Another useful tool is the small precision square; the surfaces of the square are scraped true and the angle is extremely accurate.

Another feature of value consists in the regularly-spaced 10-32 holes in the top and sides. The holes spaced on 2-in. centers permit the clamping of fixtures and accessories to the surface. The microscope that fits the Universal Measuring Engine mounts above the plate by these holes. Another accessory is the

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Used in DETROIT SWEEPER ATTACHMENTS

Single-type Pullmore Clutches are used in Detroit Sweeper Attachments for transmitting power from the tractor engine to the sweeper brush. The clutch is located in a small power take-off unit; one of many ways in which these compact clutches are applied with excellent results. Pullmore Clutches are readily adapted to a wide variety of design requirements, operate smoothly, are reliable, efficient, durable, economical. Write today for complete information on Pullmore Clutches and details of our free engineering service.

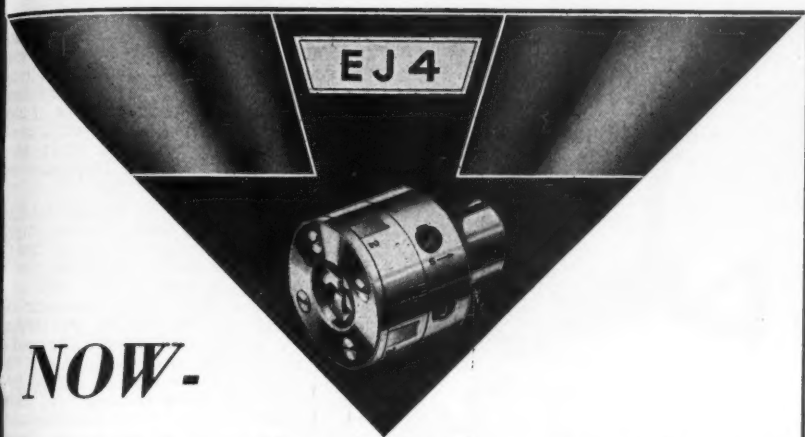


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Invading a new field of small-diameter threading, Geometric presents the Style EJ4 Solid Adjustable Die Head. This new tool brings to the present user of solid dies all the advantages of adjustable, removable-chaser die heads, and the assurance of the Geometric trade mark.

The cost of the Style EJ4 is small, and the cost of chasers is less than most solid dies. The chasers can be resharpened often, giving longer life. And adjustment within the head makes the last thread as accurate as the first.

Four rigidly-supported chasers are used. The tool is light and compact—small enough to swing in the No. 00 Brown and Sharpe Automatic Screw Machine. Diameter of head—1"; length without shank— $\frac{3}{4}$ ". Built with plain shank or with threaded backpart for the Brown and Sharpe Threader.

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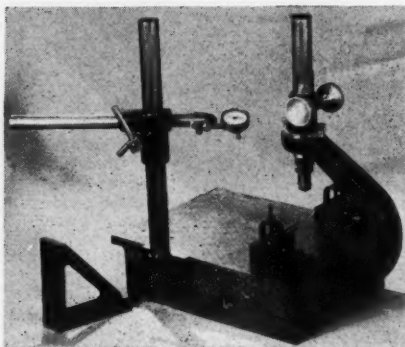
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Company

Address



Mico Three-Angle Surface Plate

clamp bracket and adjustable rods for holding dial gages and similar small tools in position above the plate.

The accessories are also simple and sturdy, with mounting holes that match the spacing of those in the bed and carriage. An accessory that greatly increases the versatility of the engine is the cross carriage, which has 2 in. of movement. Highly-finished ways result in very low friction and high rigidity.

The addition of the cross carriage converts the engine to a two-coordinate measuring device of 2x8-in. range with an accuracy of 0.0001 inch. This combination is one of great usefulness where mechanical measurements of high precision are required, as its range covers much of the smaller work which must be checked by tool and inspection departments.

The addition of a simple marking punch attachment converts the engine into a laying-out machine of 2x8-in. range, which permits the laying out of small dies, jigs, and other tools in a minimum of time. Small punchings and other parts can be copied by locating the part under the microscope and a blank steel piece under the punch. By this method a part can be copied in a fraction of the time necessary to measure it and transfer those measurements back into a layout by the usual conventional means.

Holders for dial gages and similar tools permit the production checking of tapers, and vee-blocks and centers provide means for holding screws and other parts in position for measurement.

The engine and cross slide can be furnished with English or metric screws. The English screws are 20 threads per

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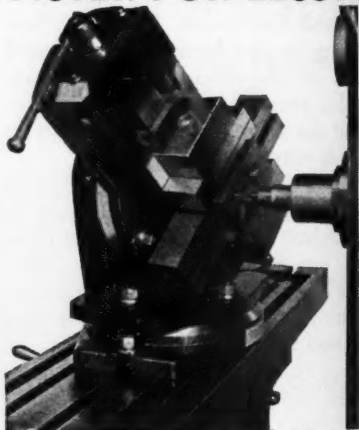
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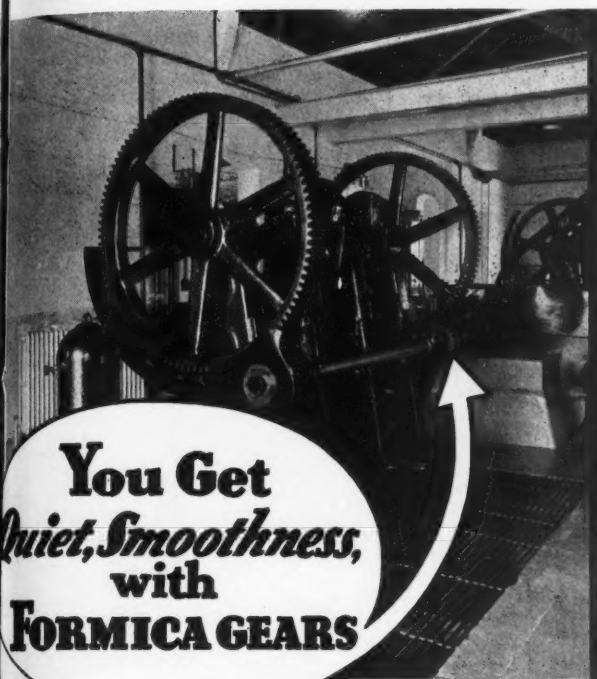
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- Beatty Machine Works
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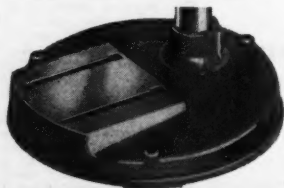
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Here's a high-quality, precision-built drill press that will handle a multitude of run-of-the-shop jobs—priced within the reach of any plant.

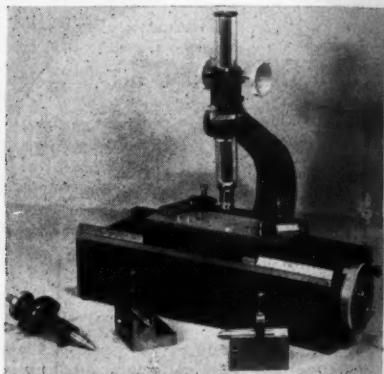
You'll have to examine this tool to see the fine workmanship and materials that make it a high value at the price. But these features will give you an idea: Jacobs (0 to $\frac{1}{2}$ ") Key Chuck, 6-spline spindle with 4 SKF ball bearings, 4" spindle travel, positive spindle lock, and a $\frac{1}{2}$ H.P. split-phase motor. Supplied in bench or floor model. Full details and specifications on request. Walker-Turner, Inc., 747 Berckman St., Plainfield, N. J.

**Engineered POWER TOOLS**

in. with 3-in. drum of 100 divisions reading directly to 0.0005 in. The cross slide screws are also 20 threads per in. with 2-in. 100-division dials reading directly to 0.0005 in. The metric screws of 1 mm. pitch are used with drums graduated into 100 parts, thus reading directly to 0.010 mm. with graduations large enough for estimation to 0.001 mm. The screws have periodic and progressive errors of less than 0.0001 in. or 0.002 mm.

Mico 20-CM Universal Measuring Engine

The Mico 20-CM Universal Measuring Engine shown in the illustration, product of Mico Instrument Company, Cambridge, Mass., comprises an accurate

**Mico 20-CM Universal Measuring Engine**

measuring device of unusual simplicity and versatility. The design is such that simple or fairly complex length measurements can be made. With this equipment measurements of length of opaque objects 8 in. (20 cm) or less in length are possible to an accuracy of 0.0001 in. and measurements of transparent objects of 4 in. in length or less.

The fundamental device consists of the bed with screw, nut, and associated parts, together with a simple carriage, reading microscope, and microscope mounting. The simple carriage is 6 in. long, but it has a travel of slightly more than 8 in. Objects longer than 6 in. must overhang the carriage or be used on some of the auxiliary devices.

The bed casting is machined all over, and a series of tapped holes spaced on

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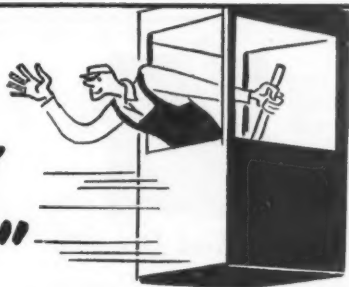
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"SEE YA NEXT TRIP, JOE!"



That's how it was when this broaching machine operator had to call on an overhead crane every five minutes. He usually waited 3-4-5 minutes . . . and it costs money when you hold up skilled machine operators. The Zip-Lift, designed especially for "Spot Handling" beside machine tools, saves time, saves money and steps up production.

How this ZIP-LIFT Paid for Itself In 40 Days

When this Zip-Lift jib crane was installed, time was saved in getting materials from the stock pile to the chuck. The broaching machine's output was doubled — 6 pieces per hour were "spot handled" instead of 3. Shop rates of \$1.50 an hour meant an actual saving of \$12 a day — crane and operator free for other duty. The complete installation paid for itself in 40 days.

The Zip-Lift is low in cost—easy to install. Write for literature. Address the Harnischfeger Corp.

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The **ZIP-LIFT** stops waste with



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2-in. centers offers mounting possibilities for many accessories, both front and back. The microscope arm is attached to the bed by four screws, so that it can be mounted in a variety of positions. Heavy loads can be carried on the bed casting without danger of warpage or distortion. Two or more microscopes can be mounted, or a microscope and ruling attachment can be mounted side by side. Provision has been made for the illumination of transparent objects as spectra plates through one end of the bed.

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Reichert Universal Camera Microscope Type "Me F"

A highly efficient and up-to-date apparatus comprising an ingenious combination of several instruments in one universal camera-microscope for facilitating every possible method of microscopic examination to be performed either in transmitted or incident, ordinary or polarized light, has been brought out by C. Reichert Optical Works of Vienna and is being marketed through their American agents, Pfaltz and Bauer, Inc., Empire State Building, New York, N. Y. The features combined in this instrument make it possible to use it, with very little changing, for visual work, for photomicrography, for micro-projection, and for micro-drawing and record work. A variety of methods of illumination are available which can be used in any order required.

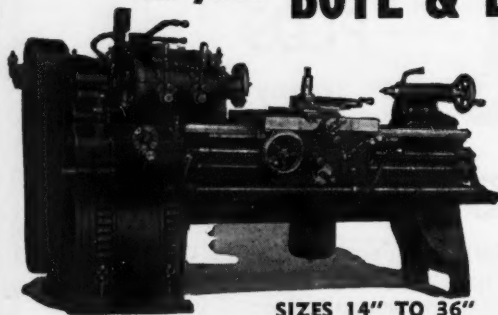
Incident light is made available as bright-ground illumination by plane glass plate, bright-ground oblique illumination by strip mirror, dark-ground illumination with the light directed concentrically and obliquely, and as polarized light. Transmitted light is made available for bright and dark-ground illumination and as polarized light. In

addition to the usual photomicrographs, slightly enlarged general survey photographs can be made up to a scale of 1:2 with "neupolar" anastigmatic photographic lenses having focal lengths of 30, 50, 75 and 100 mm. The inverted arrangement of the microscope, when working with incident light, has the advantage that the objects being examined are simply placed on the instrument and need not be mechanically or optically positioned. Generally speaking, this arrangement has the additional advantage that objects of practically any size may be examined. Objects up to 200x200 mm. (8x8 in.) can be examined as they stand.

The coarse focusing, acting on the stage, has check springs and a locking device. The stage can be raised as easily as it can be lowered and the object under examination may be fairly heavy. The coarse focusing has a scale for the working distances of the several objectives, which means that each objective is automatically coarse-focused at the correct distance. The fine focusing mechanism is independent of the coarse focusing and has a zero mark so that the micrometer screw has full freedom of motion up and down.

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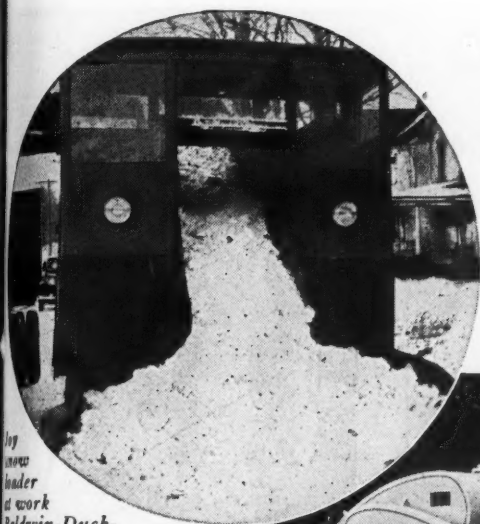
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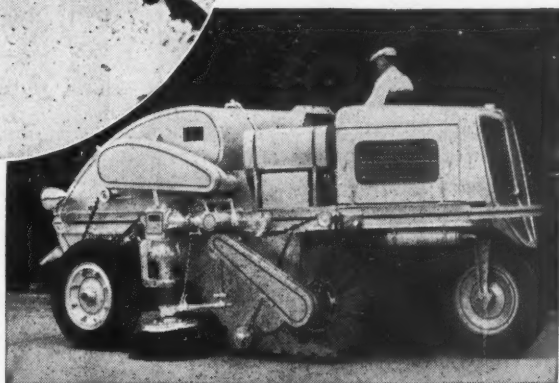
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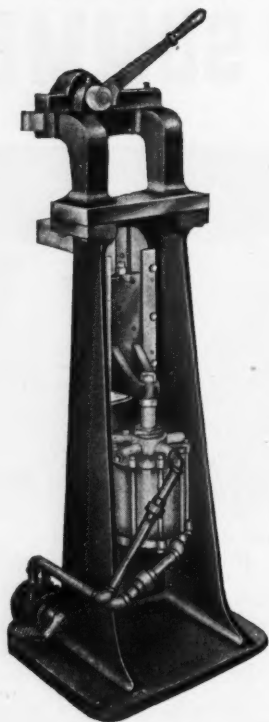
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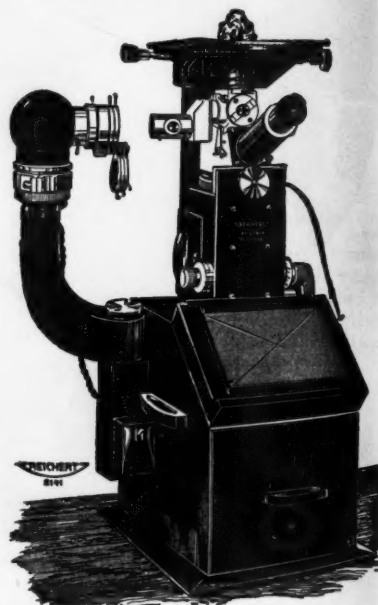


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HI-DUTY MARKING MACHINE**

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

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scope are permanently centered with respect to each other so that no tedious preparations are necessary when changing over from visual work to photography. Even when the opaque illuminator is used, the light always remains properly adjusted to the illuminator independent of the microscope setting. The eyepieces for visual work and photomicrography are so accurately matched

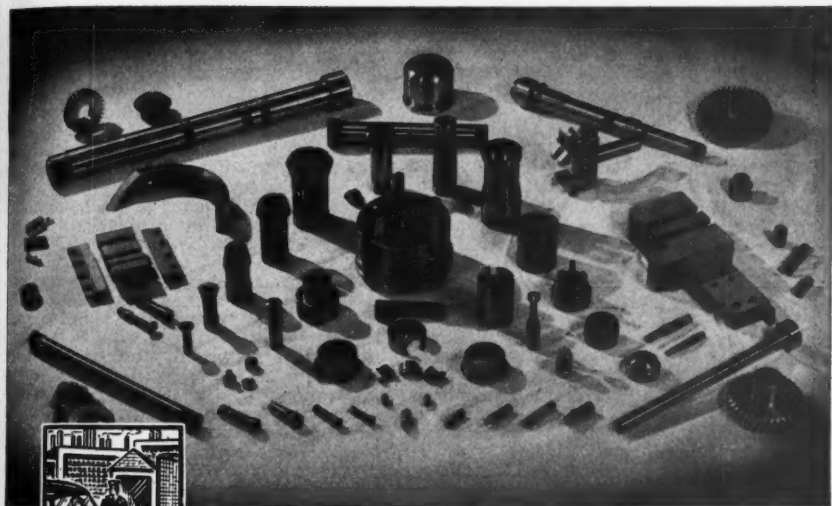


**Reichert Universal Camera Microscope Type
"Me F"**

that the image observed visually appears sharply focused on the focusing screen as well when the measuring eyepiece with adjustable eye-lens is used in the observing tube for correcting errors of vision.

All the fittings are arranged so that they can conveniently be manipulated by the observer sitting in front of the instrument, without the need of remote control devices. The camera focusing screen is directly in the observer's line of vision, being arranged, desk form, at the front of the apparatus underneath the observing tube. It also serves as an observing screen for demonstrating the microscopic image to several observers at once. The bellows length being invariable, all photographs taken with

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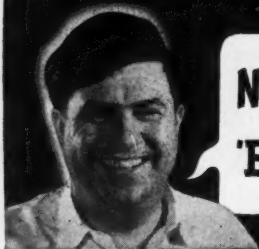
MODERN COLLET & MACHINE COMPANY
401 SALLIOTTE ST. ECORSE, MICH.

the same combination of objectives and eyepieces are of the same scale of magnifications and directly comparable. The instrument can also be equipped with an extension camera bellows so as to make it easy to obtain definite magnifications. The entire apparatus is so compactly constructed that absolutely steady images can be guaranteed even at the highest magnifications. The space required for all work which the instrument is capable of doing measures only approximately 10x14 in. area by 16 in. high.

The optical equipment, objectives and eyepieces for visual work and photomicrography in incident light are all housed in the base of the instrument. For equipment provided with auxiliary apparatus, special storage cases are provided which, while the instrument is being used, remain rigidly connected to it and act at the same time as arm-rests for the observer. The Universal Camera-Microscope Me F can be placed as it is used in a large cabinet measuring 29x38x46 cm. (approximately 11½x 15x18 in.) and taken from the cabinet again, ready for use, as required. The total weight of the instrument, including accessories and cabinet, is roughly 50 pounds.

A special feature of the Me F consists in that the base has been designed to serve as the camera portion of the instrument. This arrangement gives the integral combination of microscope and camera which is so convenient and advantageous in many ways. A drawer in the front of the base contains the incident light objects and the eyepieces for visual work and photography. The spherical lamp casing is well ventilated and light-tight and is fitted with a reflector. It can be pivoted about its horizontal axis or moved up and down so that the lamp can be positioned correctly for the various methods of illumination. Marks are provided to indicate the proper setting of the lamp for the particular type of illumination used. The light source is a 6-volt, 5-ampere low voltage bulb of the close-coiled filament type connected up to the mains through a resistance in the case of direct current or a transformer in the case of alternating current. Immediately below the microscope is incorporated a self-setting Ibsor shutter for time, bulb and various instantaneous exposure speeds. The holder for the photographic eyepiece is inserted sideways, and can be replaced by a simple cover plate when photomicrographs are being taken. The

STRONG-ARM JOE SAYS:



**NOW I CAN SOCK
'EM DOWN TIGHT**



I sure ought to know screws. I've busted enough of 'em in my time, Lord knows. And drilling out broken ones is a swell job . . . not! But, when the boss started buying MAC-ITS, my broken screw troubles ended. No wonder. You can't expect me to twist off a piece of heat-treated alloy steel. So, now I can sock 'em down . . . and not worry.

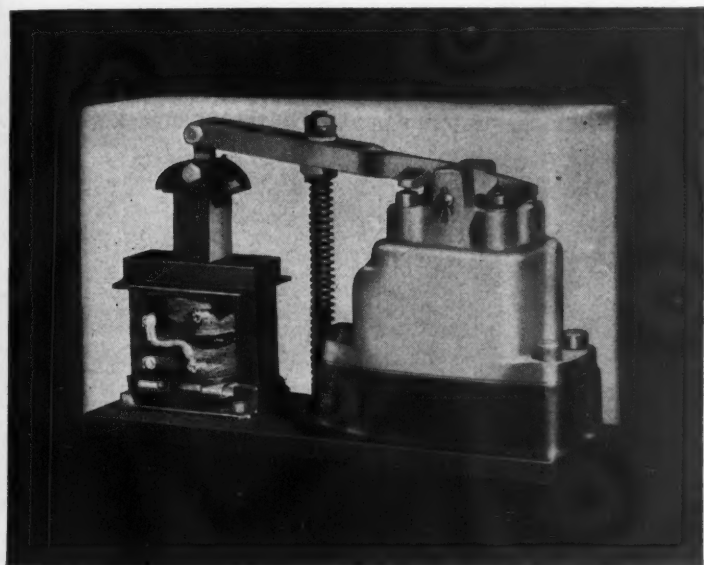
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Heat-Treated Alloy Screws



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Simple in design—lightning swift in operation. The fastest operating valve on the market. All ports on one face, making installation and servicing easy. Made in hand, foot, mechanical and solenoid controlled types, for the control of both single and double acting cylinders.

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Detroit, Michigan

reflecting mirror located at the bottom of the instrument can easily be taken out and cleaned. The instrument is ordinarily supplied with a rigid bellows giving the same magnification as the visual image, although if desired an extensible can be supplied to give a magnification up to 1-1/3 the visual image.

Aladdin Welding Rod for White Metal

White metal of the type which is used for die castings and which has been thought unweldable for many years can now be welded by the use of Aladdin Rod, according to the manufacturers of the rod—Aladdin Rod & Flux Manufacturing Co., P. O. Box No. 935, Madison Square Station, Grand Rapids, Mich. By the use of Aladdin Rod it is said that anyone can make a homogeneous weld on any metals having a zinc or aluminum base. The weld is said to be stronger than the base material and therefore reinforcing is generally unnecessary except where the break is due to an inherent weakness as a result of improper design. Aladdin Rod is said to assure successful welding of automobile door handles, radiator ornaments,

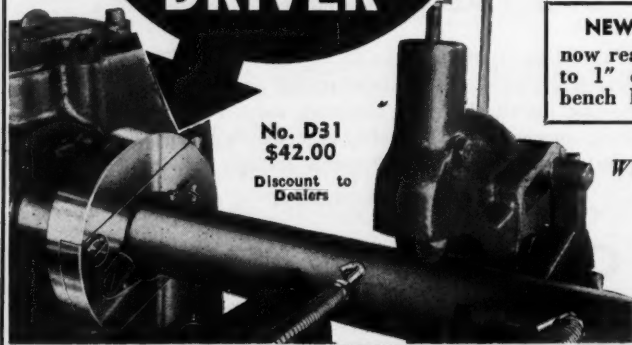
washing machine parts, typewriter parts and other parts that are made of white metal or die castings. When parts are made of this metal they can readily be built up and machined.

"General" Pipe and Bar Rack

The General Fireproofing Co., Youngstown, Ohio, has brought out a pipe and bar rack of heavy construction consisting of two upright assemblies made up of posts, brackets and base channels. The upright assemblies are connected at top and bottom by formed channel plates and diagonal stay braces. The base is of heavy 6-in. channels and the posts are 2x3-in. channels. Brackets for carrying the load of pipe or bars are bolted to the posts, which are punched at 3-in. intervals for space adjustment.

The brackets are of heavy section and each will support a load of 2000 lbs. Each has a front lip to hold stored material in place and has a clear depth of 12 in. Each upright is equipped with 14 brackets and the base is also fitted with front lips so that it may also be used for storage purposes. Where the character of the stored materials makes it desirable, standard shelves of 12-in. depth may be placed on the brackets.

SENECA FALLS AUTOMATIC WORK DRIVER



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Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces — straight or taper. Eliminates dogging time. Reduces tool breakage.

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It's *EASIER* to Use *THIS* Diamond Dresser!



... and you save at least 25% in dresser costs

Here is a fool-proof, abuse-proof diamond dresser that gives you diamond results without diamond worries! Here's why:

- (1) You eliminate all remounting expense (just a quarter turn of dresser in holder presents a new cutting face).
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- (3) You eliminate all hazards of loss or breakage.
- (4) You get a uniformly priced

dresser not subject to constant diamond market fluctuation. (5) You get uniform, dependable results. (6) You get a dresser that will reduce your dressing cost at least 25%!

Investigate the Diamond-Impregnated Carboloy Dresser! *Get diamond results without diamond worries!* Send for free booklet.

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New Booklet Shows How to Save at Least 25% on Grinding Wheel Dressing Costs...

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For precision jobs and repairing hard-to-get-at places on machines, without removing the part or dismantling machine. Uses 200 different accessories, instantly interchangeable.

Fastest and most powerful tool for its type and weight, 12 ounces, 25,000 r.p.m. 110 volt, AC or DC.

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M. M. S. 3

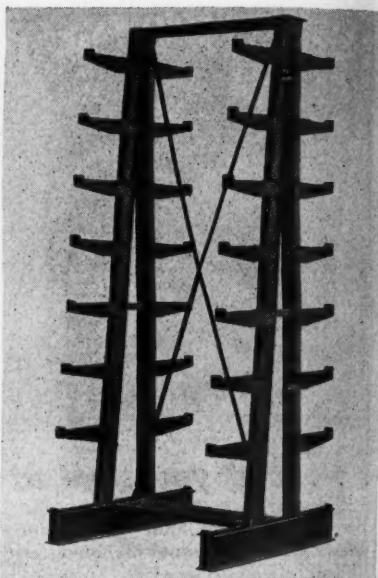
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Pipe and bars of any length may be stored on these racks by assembling the required number of racks. In such cases one starting unit complete as above described and the required num-



"General" Pipe and Bar Rack

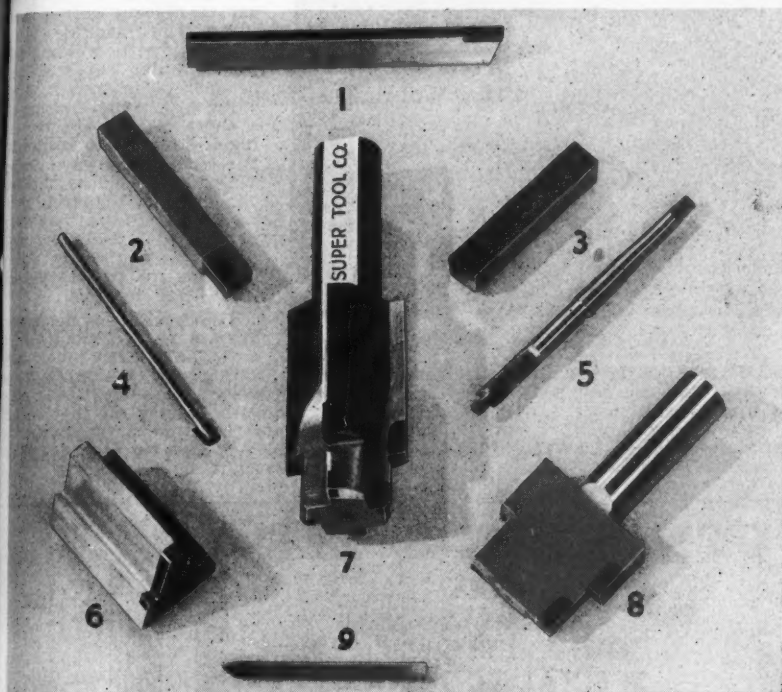
ber of additional units, consisting of one upright assembly only and the connecting members, are used.

Lombard Bench Power Grindstone

For use in the sharpening of cutting tools of all kinds upon which perfect cutting edges are desired, Lombard and Company, Winter Hill, Somerville, Mass., has brought out the bench power grindstone shown in the illustration. The machine is designed to duplicate on a small scale the methods and conditions used by the best manufacturers of fine tools and cutlery. Every effort has been made to produce a durable and practical grinder.

The stone, which is the most important part of the machine, is a 14x2-in. Nova Scotia stone made by Lombard. The sides of the frame are of hardwood and the bottom of heavy galvanized

TECO TUNGSTEN CARBIDE TIPPED TOOLS



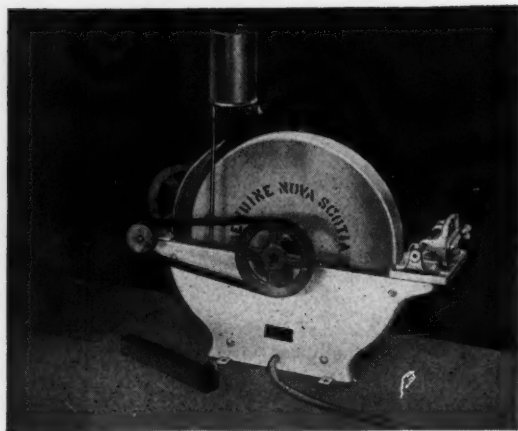
reputation earned by **PERFORMANCE**

1—Piston Grooving Tool. 2—Standard Turning Tool. 3—Square Nose Tool. 4—Porcelain Counterbore. 5—Combination Drill Counterbore. 6—Form Tool. 7—Four Fluted Step Reamer. 8—Flat Drill. 9—Glass Drill.

Super Tungsten Carbide Metals insure LESS BREAKAGE — MORE PRODUCTION—GREATER ECONOMY.

Write for Catalog, price list, and complete information.

SUPER TOOL COMPANY
356 EAST CONGRESS ST. DETROIT, MICHIGAN



Lombard Bench Power Grindstone

iron. It is claimed by the manufacturer that the hardwood will last longer than cast iron or steel and, heavily painted, will resist corrosion for many years. Shafts are of steel and babbitt bearings are used.

The machine is equipped with a special tool holder which will be found practical for grinding all bevel edged tools. The tool holder is built with a brass slide bar to prevent corrosion and rust. The machine is also equipped with a hand-made copper water pot with brass petcock. The trough is provided with a brass nipple and a short piece of rubber tubing is supplied to insure that the trough is always drained. Water is applied by the water pot only and the stone should never be allowed to be in contact with the water in the trough. An abrasive stick is provided for truing the stone from time to time.

The machine is designed to operate directly from a standard $\frac{1}{4}$ h.p., 1750 r.p.m. motor or from a countershaft of similar speed. Under these conditions, a $2\frac{1}{2}$ -in. pulley belt to the 6-in. pulley on the machine will operate the stone at approximately 800 r.p.m. Space required, 23x8 in. Shipping weight, 50 pounds.

PUTNAM HI-SPEED

REAMERS END-MILLS COUNTERBORES SPECIAL TOOLS

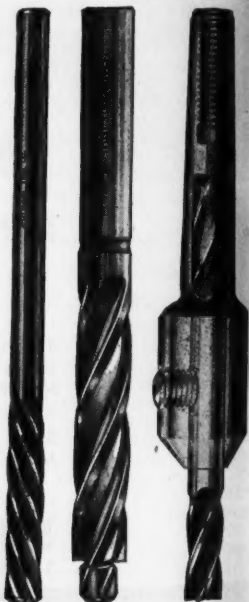
● Here's a complete line of finest precision tools including several important new tools designed to **REALLY CUT COSTS**. ALL PUTNAM TOOLS are fully warranted as to quality of material and workmanship and experience proves that they offer maximum accuracy—speed—and endurance.

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gives complete information on the entire PUTNAM
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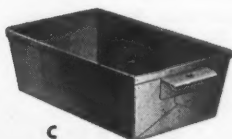
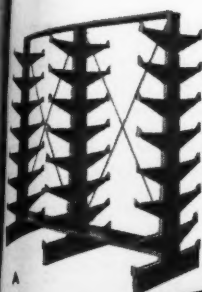
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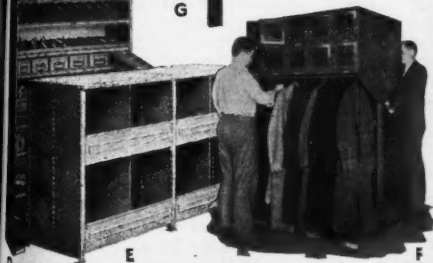


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CUTS COSTS

• The Lyon units illustrated here have an industry-wide record for reducing stock handling, inventory costs, and tool room losses. They provide a definite space-saving place for everything. They keep that material in its place, and facilitate its speedy handling as needed.

Select one or several of these units which fit your stock or tool room needs and check coupon to receive details on their time and money-saving possibilities.



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STORAGE EQUIPMENT

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1303 River Street, Aurora, Illinois

Send Bulletin on A ☐ Bar Racks B ☐ Stock Cart C ☐ Tote Boxes D ☐ Tool Room Equipment
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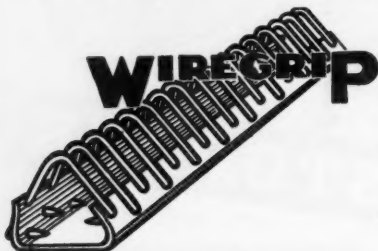
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Wiregrip Carded Belt Hooks

Armstrong-Bray & Company, 303 Sheldon St., Chicago, Ill., are announcing a new line of Wiregrip Carded Belt Hooks.



Wiregrip Carded Belt Hooks

Wiregrip Belt Hooks are mounted on special processed cards (patent applied for) that hold the hooks firmly in the card, strengthening them and permitting the workman to easily cut off the desired number of hooks without destroying or disturbing others. According to the manufacturer, Wiregrip Hooks are made of the finest wire available for this purpose, and will stand long, con-

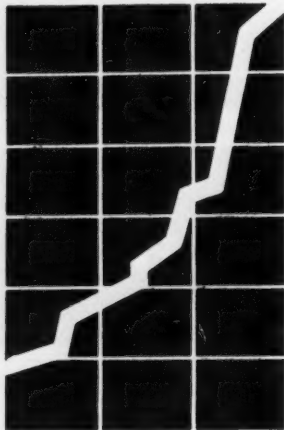
tinuous, hard usage.

Wiregrip Hooks may be applied with any standard lacer, or with a Wiregrip Belt Lacing Machine.

Pangborn Electrostatic Precipitator

An electrostatic precipitator for general industrial air cleaning use has been developed by the Pangborn Corporation, Hagerstown, Md. The unit is said to be particularly suitable for salvaging valuable dust, mass air cleaning, or removing objectionable particles from gas or vapor and for similar applications, and is said to have an operating efficiency as high as 99 per cent by weight. Electrical parts are supplied by Westinghouse Electric & Manufacturing Co.

The Pangborn Electrostatic Precipitator is said to have the following advantages: (1) The small size of the unit reduces space requirements and cost, and permits a complete factory assembled unit. (2) The small vacuum tube power pack is attached directly to the precipitator cabinet, eliminating the usual separate room for high voltage generating equipment. (3) Discharged air does not contain appreciable amounts of ozone or oxides of nitrogen and may



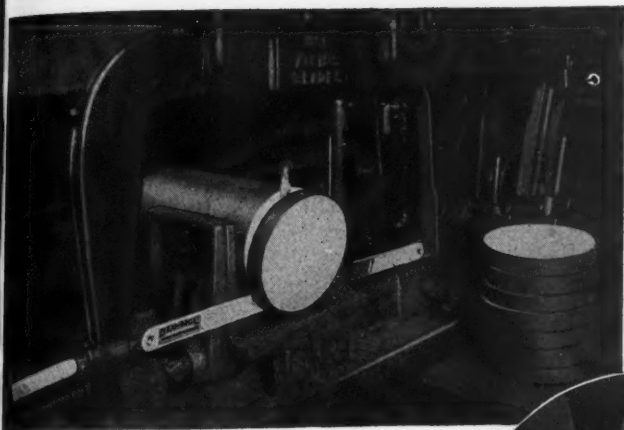
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WILMINGTON FIBRE SPECIALTY COMPANY

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ARE YOU GETTING *Performance* LIKE THIS ?

This is an actual photograph of a BLU-MOL Molybdenum hack saw blade on the job, and here's its actual performance record at the time the photograph was made:

MATERIAL— $3\frac{3}{4}$ inch bar of Crescent Tool Steel, analyzing 100-110 carbon.

SPEED—75 strokes a minute.

PRESSURE—125 pounds.

PERFORMANCE—152 cuts—1678 square inches.

The teeth were still keen, the set in excellent condition and the blade was still cutting true and fast. The operator estimated it was good for at least 70 more cuts, or a total of 2448 square inches—a blade cost of only $1/3$ mill per square inch.

Here's proof that BLU-MOL Molybdenum Blades give the lowest cost per cut of any hack saw blade on the market. If you're not using BLU-MOL Blades it will pay you to investigate. For a test on your own work 'phone a BLU-MOL distributor or write to us.

MILLERS FALLS COMPANY

Greenfield, Massachusetts



be breathed without irritation of the membranes. (4) The equipment may be designed for efficiencies as high as 99 per cent by weight and to remove particles as small as one-fifth micron. (5) The machine operates at low voltages, permitting the use of electronic tubes of standard industrial classification and with low power consumption. (6) The low and constant air flow resistance through the unit results in reduced power and uniform air volume.

The illustration shows a unit which was recently built for a large pottery plant to remove excess glaze dust from



Pangborn Electrostatic Precipitator

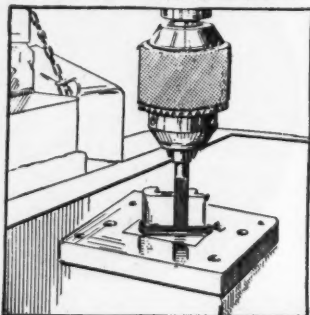
the air. In general, the complete unit consists of three parts; collector cell, ionizing assembly, and power pack. These can be furnished assembled in a standard cabinet or as parts for assembly in existing duct work or special cabinets.

Bristol Coordinated Control System

A new system, known as the Coordinated Control System, for automatically operating all of the technical operations and factors of an industrial process has been announced by The Bristol Com

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Rotary Filing Punch in Drill Press
70 SHAPES & SIZES IN STOCK

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"OUTWEARS

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20 years ARGUTO without a drink—

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WE ASK YOU--

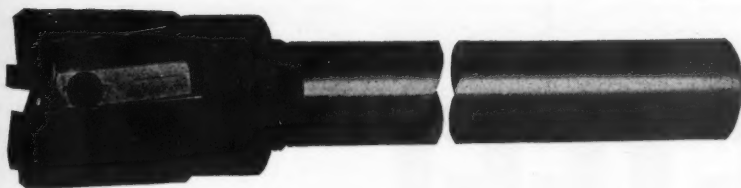
Does your reamer grinding life cost as little as

2c per .001"

It would if you were using

G & G

SERRATED BLADE CAM LOCK REAMERS

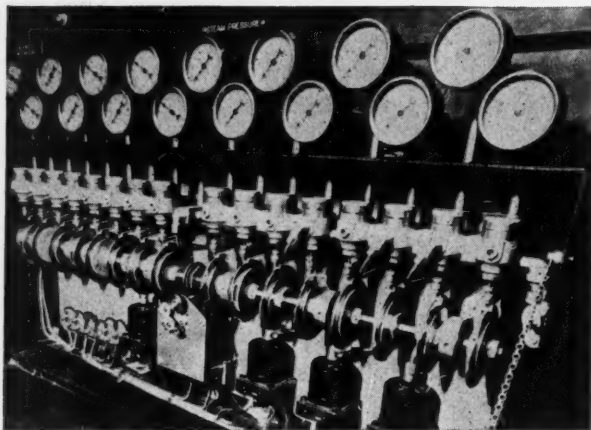


Divide the cost of a set of the reamer blades you are using by the number of thousandths of an inch of grinding life they will provide and decide on their economy for yourself.

Serrated blade cam lock reamers provide as much as $\frac{5}{8}$ " grinding life on the diameter of the $4\frac{1}{2}$ " size. Other sizes proportional.

Goddard & Goddard Co.

DETROIT, MICH.



"Mechanical Brain" and Recording and Controlling Instruments of the Bristol Coordinated Control System

pany, Waterbury, Conn. The system makes it possible to put even the most intricate scientific process under complete automatic control, thus eliminating the necessity of leaving the manipulation and control of critical operations

tem was the tie-over from the experimental stage to the full-scale plant stage that made for success.

The Coordinated Control System can be applied to any process of which the exact schedule of operation for best

in the hands of plant operatives.

The control system is intended for processes that are developed and perfected in the laboratory and pilot plant, and which depend on rigid control of such factors as the time of operations of valves (all sizes up to large gate valves), pumps, blowers, dampers, etc., and the control at a definite value or according to a time program of such variables as temperature, pressure, liquid level, flow, humidity and speed for their success. It has been found in a number of cases that the Coordinated Control Sys-

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Every Purpose . . in Stock . . Ready to Use

Here is steel in every shape and size in carbon and alloy grades—in stock for immediate shipment. Whether it is standard shafting or the finest accuracy stock—stainless steel or special flame cut plates, you can get quick delivery from the nearest Ryerson plant. Allied lines such as welding rod, solder, babbitt and tools are also included. Unusual facilities for cutting, handling and shipping assure accuracy, dependability and speed.

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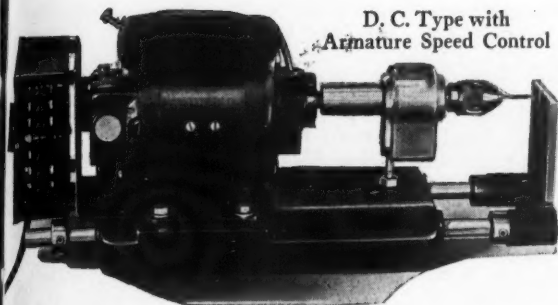
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D. C. Type with
Armature Speed Control



Flexible and rapid, the compact Wahlstrom Bench Type Portable Tapper is a big time and labor saver in many plants; capacity $2/56$ to $1/4$ inch; the direct current model. Note the apron mounted on sturdy, adjustable supports which can instantly be regulated for a wide range of work. Breakage of small size taps is greatly reduced.

The Wahlstrom

Bench Type Portable Tappers

VERTICAL as well as horizontal tapping can be done with the Wahlstrom Bench Type Portable Tapper. Its distinctive design is NOT of the friction type of construction; therefore it is equally adaptable to tapping at any vertical position or angle—a great advantage where production embraces variable sizes and shapes of work. The Wahlstrom Tapper is full automatic, operating always on the forward motion when contacting the work; yet it will instantly reverse (automatically) at the slightest backward pull of the apron or the work being tapped. Tap will instantly resume the forward motion when released from the hole, thus greatly reducing dulling and breaking of taps. In encountering clogged holes or the extremities

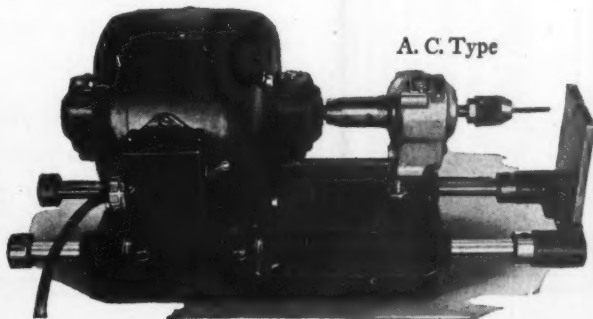
of blind holes, the tap is instantly thrown out of motion, though the spindle continues to revolve, ready to immediately resume operation. Equipped with $1/6$ H. P. Motor, 1140 r.p.m., with provision for cutting down speed 50% when using maximum size taps. A money-making unit for the large as well as the small shop.



Wahlstrom Tool Division
American Machine & Foundry Co.
5502-5524 Second Avenue, Brooklyn, N. Y.

Portable, easily moved from place to place—saving time and additional handling on small work; capacity $2/56$ to $1/4$ inch; alternating current model illustrated; a splendid unit to prevent congestion around permanently located tappers. Production executives should write for an illustrated folder on the only fully automatic tapper with the unique advantages of Wahlstrom construction design.

A. C. Type



over-all results is known—processes which depend upon close control for product quality—processes that give trouble because their schedule of operation is such that operators find it difficult to follow them manually.

The exact "formula", sequence of operation, or control point of each factor affecting the quality of product and yield recommended by the designer of a process can be built into the Coordinated Control System. The control system carries out each step and controls each factor with split-degree accuracy.

The Coordinated Control System is an automatic machine built in the form of a master control station. It consists of recording and controlling instruments built around the so-called "Mechanical Brain". Each system is designed and engineered for the particular process on which it is used. The instruments are standard instruments selected for their ability to perform a given duty in co-operation with each of the other instruments in the system.

The "Mechanical Brain" coordinates the efforts of instruments and automatically regulates all of the operations in the process. It is in a way the "pace maker" or "monitor" in that it regulates all of the operations, making them

take place in their proper sequence and run for a scheduled time.

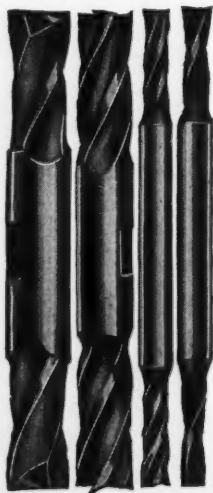
Foote Bros. Fractional Horsepower Motorized Speed Reducers

Foote Bros. Gear and Machine Corporation, 5303 South Western Blvd., Chi.



Foote IXL Fractional Horsepower Powered Gear

cago, Ill., has added to its standard lines a complete line of fractional horsepower motorized speed reducers, to be known as IXL Fractional Horsepower



SHEAR CUT Single and Double END MILLS

THEY shear cut the metal instead of the old way of cutting. They'll cut faster, also leave that smooth finish you want. Why? It is the way they are ground.

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Ask your Stanley distributor
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With this light, compact electric sander, a man can handle production and maintenance jobs easily and quickly. Scouring and cleaning vats, surfacing wood or metal, removing rust and paint, grinding heavy welds, smoothing castings or sheet metal, rubbing or polishing stainless steels, and removing labels or stencils are some of the many ways in which this inexpensive tool soon pays for itself.

It's light, powerful . . . built for long life and made free-running by ball bearings throughout. Equipped with heavy rubber-covered three-conductor cable.

STANLEY ELECTRIC TOOL DIVISION
THE STANLEY WORKS
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HIGH SPEED GAGING to $\frac{1}{2}$ of 1/10,000th

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Use Comtorplug for ball bearing housings, wrist pin seats and all holes requiring a high standard of accuracy.

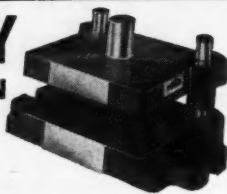
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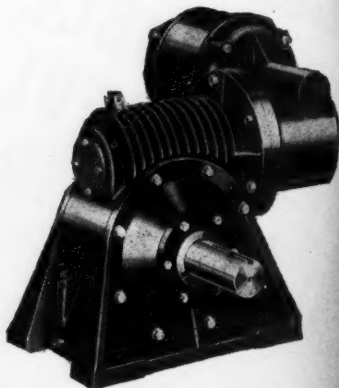
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Powered Gears. These units range in size from 1/50 h.p. up to $\frac{3}{4}$ h.p. and in ratios from 2:1 up to 8000:1. The various types include single and double reduction worm gear, single reduction heli-



Foote IXL Fractional Horsepower Powered Gear

cal gear, and combination worm gear and planetary gears at higher ratios. The units are sturdily built and of symmetrical design.

Mathews Ball Bearing Heavy Duty Rollers

The Mathews Conveyor Company, Ellwood City, Pa., announces two new ball bearing roller designs, both suitable for heavy duty service. In both designs are incorporated self-contained double seals which protect the ball bearings and ball race-ways from foreign matter such as dust, dirt and grit. The illustration Fig. 1 shows the construction of the Type 63SB Roller. This design is available in 4-in., $4\frac{1}{4}$ -in., and $4\frac{1}{2}$ -in. diameters, with rollers in standard lengths from 6 in. to 48 in. and speed center to center from 6 in. up to suit specific requirements.

Industrial grease fittings afford a means of periodical lubrication. Load ratings vary with the three available diameters as follows: Used as gravity roller conveyor (conveyor sections set at a grade) continuous load rating per roller 4-in. diameter, 3000 lbs.; $4\frac{1}{4}$ -in. diameter, 4000 lbs.; $4\frac{1}{2}$ -in. diameter, 4500 lbs. When used in level lines: 4-in. diameter, 3500 lbs.; $4\frac{1}{4}$ -in. diameter, 4500 lbs.; $4\frac{1}{2}$ -in. diameter, 5000 pounds.

Fig. 2 features the Type 105SB Roller.

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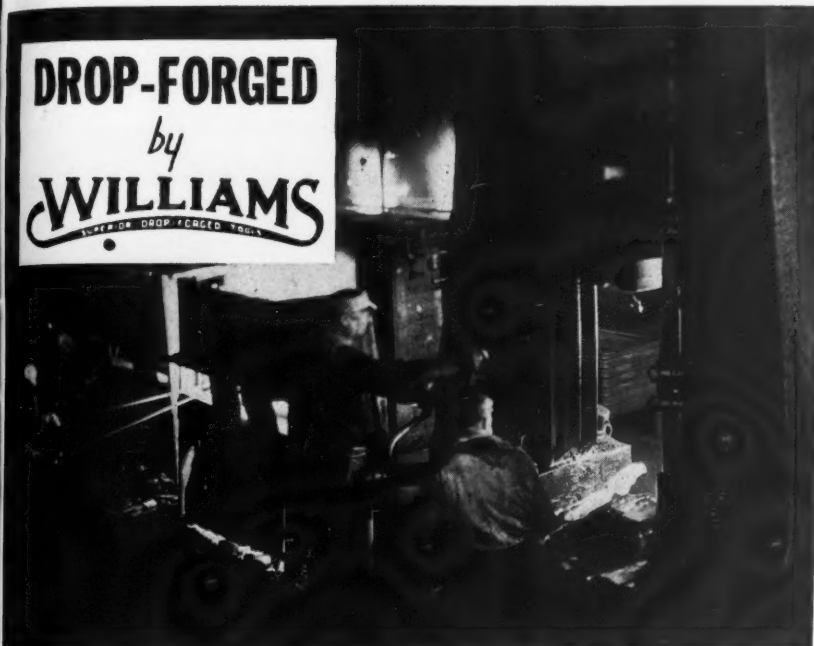
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MAKERS OF DROP-FORGED TOOLS



YOUR GUARANTEE OF QUALITY AND PERFORMANCE

● THERE is real reason why the name WILLIAMS is synonymous with quality. Back of every tool that bears this brand is a half century of drop-forging skill—fifty years of continual experiment and improvement—five decades of sticking to a tradition that “there shall be none better.” Quality and performance are the unseen values that make every Williams’ product worth *more* than the price you pay.

J. H. WILLIAMS & CO., 75 Spring St., NEW YORK

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, “C” Clamps, Latch Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs, Vises, etc.

“CARBON WRENCHES” “SUPERRENCHES” “SUPERSOCKETS”



Tough, well-balanced, dependable. 50 patterns, over 1000 sizes.



Chrome-Molybdenum steel. Light-thin-jawed—super-strong.



Thin-walled—strong—detachable sockets for fast work in close places.

This design includes similar features to those described for Type 63SB and is available in 5-in. diameters and lengths to suit within practical limits. The Type 105SB is applied for both power driven and gravity applications. Each roller has a continuous load rating of 8000 lbs. per roller.

Hexagon axles are incorporated in both types, thus preventing the inner ball race-way from rotating on the axle, which is held stationary in the conveyor frame. Seamless steel tubing is used in both designs, the wall thickness varying with the diameters as follows: Type



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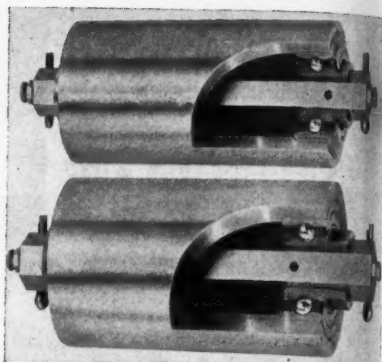


Fig. 1—Mathews 4½-In. Diameter Roller with Type 63SB Bearing for Roller Conveyor.
Fig. 2—Type 105SB Bearing for Roller Conveyor.

63SB, 4-in. diameter, 5/16-in. wall; 4¼-in. diameter, 7/16-in. wall; 4½-in. diameter, 9/16-in. wall. Type 105SB, 5-in. diameter, .710-in. wall. Frame rails of various shapes are available as standard, with rollers above or below the top of the frame as required.

T. S. T. Triple Safe Tubing

An entirely new development in flexible seamless all-metal hose, to be known as T.S.T. Triple Safe Tubing, has been placed on the market by Seamlex Company, 5-19 48th Ave., Long Island City, N.Y. The tubing is of three-ply, all-metal construction, consisting of an outer layer of seamless bronze tubing, an intermediate thickness of copper braid, and an inner wall of seamless bronze tubing, giving rise to the trade name of "T.S.T."—Triple Safe Tubing. The tubing is intended for use with



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15 standard types—foot—flange and foot and flange mountings—Worm—Helical—Spur and Planetary gears. 1/50 to 7 1/2 H.P. sizes.

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LEAD OLD BOY?**



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**R & S
DIE HEADS**

made in types and sizes galore to cut outside threads up to 10" diameter.

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I SAID
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TAPS PITCH
OLD SOCK!**



**R & S
COLLAPSIBLE
TAPS**

made in types and sizes galore to cut inside threads up to 10" diameter.

**The RICKERT
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**SHAFER Co.
PENNA**

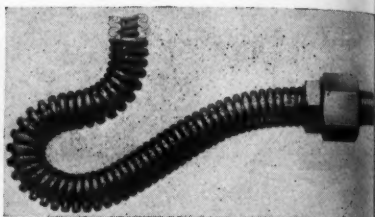
Adjustable Boring Heads; Collapsible Taps
Solid Adjustable Die Heads; Chasers;
Self Opening Die Heads; Solid Adjustable Taps



Tapping Machines; Automatic Cut-off Machines
Automatic, Single Purpose
Threading Machines.

steam, water, oil, gas, air, gasoline, paint, or practically any other liquid and the manufacturer states that the use of this tubing together with T.S.T. solderless, brazeless, packless fittings eliminates leaking joints.

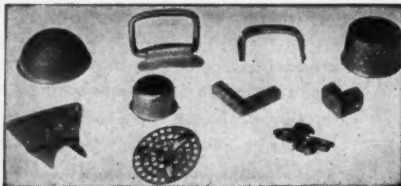
T.S.T. Triple Safe Tubing is made in six sizes, with inside diameters of $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. and with a minimum flexing radius of 6, 8, 10 and 12 in. for the four smaller sizes, the maximum working pressures of which are 500 lbs., 400 lbs., 350 lbs., and 300 lbs. respectively. The minimum flexing radius and maximum working pressures



Standard T.S.T. Triple Safe Tubing

of the two larger sizes are available upon request. One of the outstanding advantages of T.S.T. tubing is that it can be ordered in lengths of approximately 12 ft. and cut to required length in a few

STAMPINGS



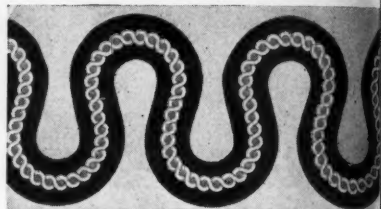
We have been in the job stamping business for over 20 years, and have a well equipped plant with 30 presses ranging from small size up to 30 ton ram pressure.

We are equipped to make our own dies in our modern die shop.

Send sample or blueprints for estimate to Dept. 1.

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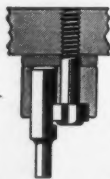
Enlarged Cross-Section Drawing Showing Construction of T.S.T. Tubing

seconds. T.S.T. fittings can be attached by the user in a few minutes.

A sample section of this tubing will be sent free to prospective users upon request.

Marschke Selective Speed Buffer

The Marschke Selective Speed Buffer shown in the illustration is now being marketed by Vonnegut Moulder Corpor-



NO OTHER PUNCH & DIE RETAINER HAS AS MANY Advantages of Design, Construction, and Operation as the HOVIS SCREWLOCK

1. Positive Accuracy—Straight Thrust and Pull Action.
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SKILSAW

ELECTRIC DRILLS

Built especially for drilling in steels of high nickel content, such as Monel and Allegheny metals, stainless steel, etc. Both models available in speeds of 350, 450, 600 and 750 R.P.M.

—can't be stalled even at maximum drilling speed!

These new SLOW-SPEED Skil-Saw Drills lengthen the life of twist-drills, eliminating the need for frequent sharpening. The $\frac{1}{2}$ in. model is new in design for a drill of this capacity. Its one-hand grip feature makes it ideal for close quarter work and for use with hole saws in places impossible to reach with side-handle drills. Both models are especially adaptable to wood boring.

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MODEL 44— $\frac{1}{4}$ in.

Capacity in steel $\frac{1}{4}$ in. in
wood $\frac{1}{2}$ in.; length overall
14 in.; weight 6 lb. 8 oz.
standard speed 750 R.P.M.
(350-600 optional);
ball bearing construction.

\$36

MODEL 84— $\frac{1}{2}$ in.

Capacity in steel $\frac{1}{2}$ in. in
wood $\frac{1}{2}$ in.; length overall
14 in.; weight 8 lb. 8 oz.
standard speed 350 R.P.M.
(450-600-750 optional);
ball bearing construction.

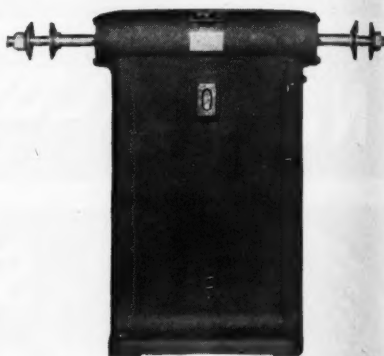
\$48



ation, 1811 Madison Ave., Indianapolis, Ind. The machine is designed to fill the need for a quality buffer with the flexibility of an individual motor driven machine. The motor is of the heavy duty open type, ball bearing, capable of 100 per cent momentary overloads which insures sufficient capacity for polishing and buffing work. The motor is mounted on removable steel back plate for accessibility. The spindle and bearing housings are assembled as a unit. Ball bearings on the spindle and motor are of double row, deep groove radial and thrust type. The spindle, which is of one-piece alloy steel, is extra strong and

rigid. The machine can be furnished as a single specified speed unit up to 3600 r.p.m., or as a three-speed machine.

Power is transmitted from the motor



Marschke Selective Speed Buffer

to the spindle pulley by a multiple V-belt. Adjustments are readily made by means of a hand screw conveniently mounted on the back of the base. The brake is manually operated by means of a hand lever protruding through the front of the base and centrally located. A manually controlled locking pin engages the spindle, providing positive locking action.

The base is a very rugged and heavy one-piece casting having three-point contact to insure perfect bearing on any floor. It is designed to absorb vibrations set up by unbalanced wheels. A magnetic switch with overload and under-voltage protection is mounted within the base. The push button is mounted flush with the front of the base for convenience.

The overall length of the spindle is

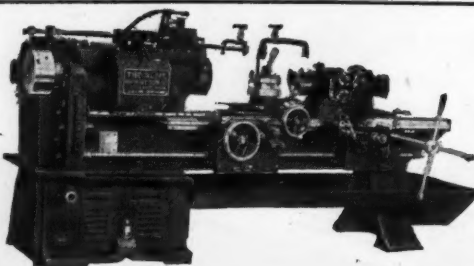
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A powerful rigid machine for a wide range of accurate bar and chuck work.

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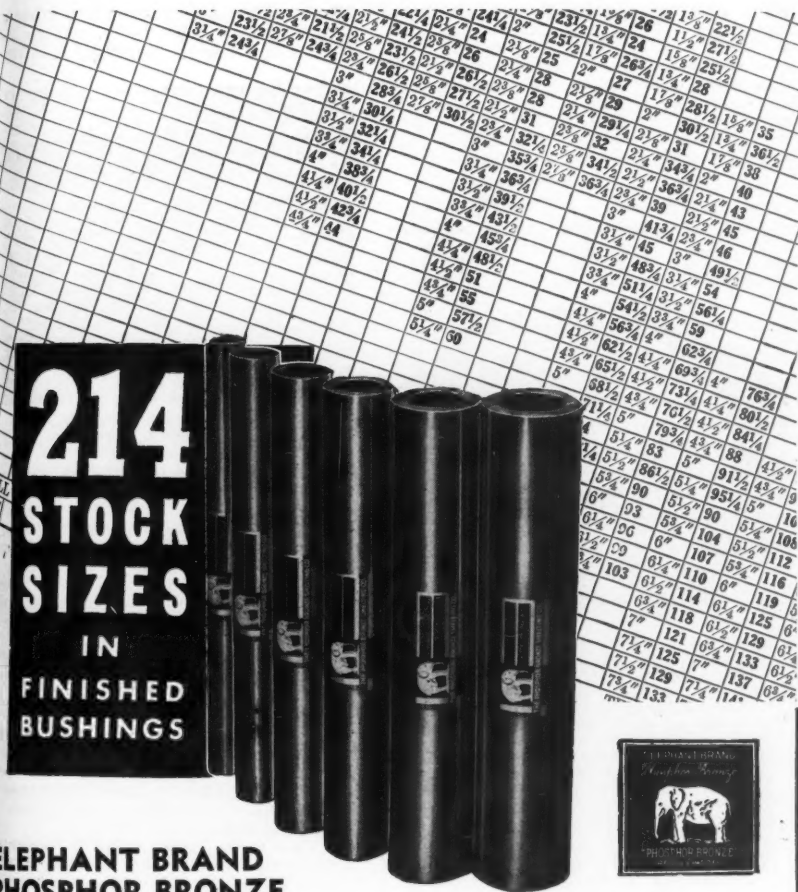
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SIZES
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BUSHINGS





ELEPHANT BRAND PHOSPHOR BRONZE

Twelve inch stock bushing bars, which have been furnished for years cast in the rough, are now offered machined with $1/32''$ plus O.D. and $1/32''$ minus on the I.D. up to and including 3" diameter . . . also, from 3" up to 6" inclusive, with $1/16''$ plus O.D. and $1/16''$ minus on the I.D. Maximum I.D. S-4. There's plenty of stock to machine down to size . . . yet you save tool-upkeep and costly waste from machining rough castings.

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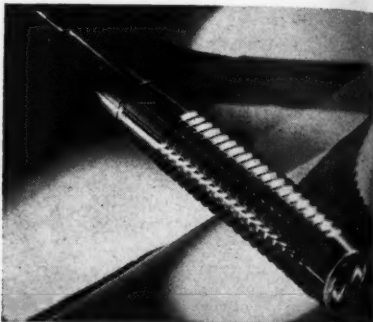
Philadelphia, Pennsylvania

50 in. and the spindle diameter between flanges is $1\frac{1}{4}$ in. Maximum width of wheels is $3\frac{1}{2}$ in. The base is 25x25 in., and the weight is either 900 or 950 lbs. depending on whether the motor is 3 or 5 h.p. The machine is intended to operate on 220, 440 or 550 volts, two or three phase, 25 to 60 cycles A.C. or 110 and 220 volts D.C.

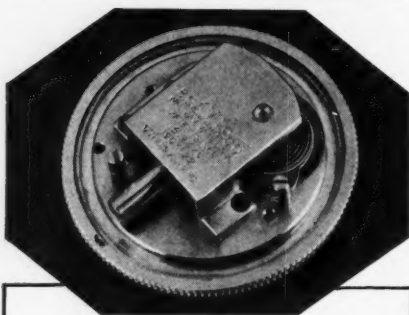
"Durakeen" Broaches

"Durakeen" Broaches, now being marketed by The Connecticut Broach & Machine Co., New London, Conn., are a combination of a recent development in

steel making and a heat treatment that combines toughness with extreme hardness. These tools possess to a marked



Durakeen Broach



Accessible

The working parts of the Ames Shockless Gauge are easily accessible. The plate assembly is shown intact and in operating position, ready to be inspected, cleaned or adjusted without being taken apart. For the many other exclusive features, write for the Ames Gauge catalogue.

AMES Shockless GAUGES

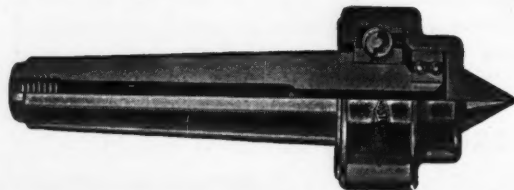
B. C. AMES CO., Waltham, Mass.

degree the ability to cut the hard alloy steels being used at the present time. Furthermore, the qualities inherent in the steel itself enable these tools to resist abrasion. This, results in more pieces per grind, and more grinds per broach,—giving greater life and, consequently, lower costs per broached piece, which is after all the object to be attained.

The qualities that give "Durakeen" its ability are not surface qualities, but being a combination of the steel and heat treatment, the surface condition is identical with the condition at the core of the broach. Consequently, there is no need to fear grinding off the special surface condition. These broaches are consistent in quality throughout the entire broach.

These tools have made it possible to broach steels after heat treating that are so hard that formerly broaching was not to be considered. Naturally, the wear and tear of any cutting tool on hard

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It turns with the work. Eliminates friction of dead center.

Lowest possible overhang prevents vibration and chatter.

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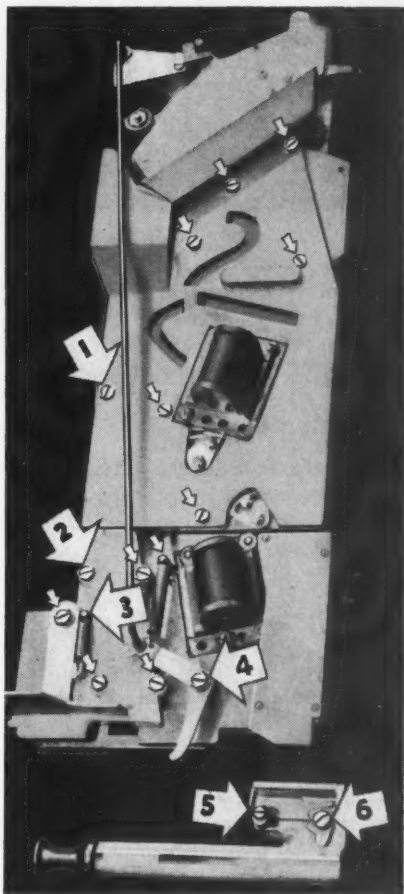
WOULD YOU "SPOT" ALL of the 33 points where the use of Self-tapping Screws eliminates tapping, and improves the product?

THIS INGENUOUS COIN MECHANISM is an important part of the cigarette vending machines produced by Rowe Manufacturing Company, Inc., New York. Since 15,000 of these machines are produced in six months, it is easy to see why the manufacturer investigated Parker-Kalon Hardened Self-tapping Screws. Merely to eliminate a few of the 44 tapping operations on each mechanism would mean a big saving.

However, because this concern obtained a really thorough understanding of the different types of Parker-Kalon Self-tapping Screws and their possibilities, 77 percent of the tapping was eliminated. *Assembly costs were cut in half. Faster, more efficient production was obtained. And in addition, the mechanism was improved through more secure fastenings.* Shown here, is one side of the unit; the opposite side is similar. A total of 33 Hardened Self-tapping Screws are used. Not only are they employed to join die cast parts and to fasten sheet metal parts to die cast sections, but also for other interesting applications described below.

A working knowledge of these Screws frequently enables design and production engineers to take full advantage of their cost-cutting, labor-saving possibilities. You can have such knowledge merely by asking us to send a Parker-Kalon Assembly Engineer to see you. His sole function is to help plant men apply Self-tapping Screws to assemblies; to point out where and how assembly work can be simplified, to lower costs.

PARKER-KALON CORPORATION
Department M 198 Varick Street New York, N. Y.



Do you use Parker-Kalon Self-tapping Screws for ALL these purposes?

1. For joining two die cast parts
2. For fastening sheet metal unit to die cast section
3. As a spring retainer stud
4. To hold a connecting rod lever in position
5. To retain a ratchet pawl spring in a slot
6. To hold a ratchet pawl in position

PARKER-KALON *Modern* **FASTENING DEVICES**



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SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

steels is much greater than before heat treating, but nevertheless, the number of pieces per grind under these conditions is amazing.

"Durakeen" broaches have been used successfully in broaching hard grades of Stainless Steel. In many cases, the hard 18-8 grades of Stainless Steel; in some cases broaching several thousand pieces per grind. They also have been used successfully in broaching parts used in the construction of airplanes; and particularly in broaching SAE 6150, which steel is commonly used in making airplane propeller hubs. When heat treated to 45 Rockwell, it becomes very tough to broach, and "Durakeen" broaches have proven very satisfactory on this class of material.

The added cost of these broaches is approximately ten per cent, and as the added life ranges from twenty-five to thirty-five per cent, the economy in using this type of broach is self-evident.

"Synhibit" Process

Thompson & Company, P. O. Box 6757, Pittsburgh, Pa., manufacturers of industrial and technical paints, has announced a new process to be known as "Synhibit" Inhibitor for preserving structural steel, and to provide a rust free surface on which better adhering protective coatings may be applied. The new process consists primarily of a scientific, chemical, and metallurgical pre-treatment of the metal surface.

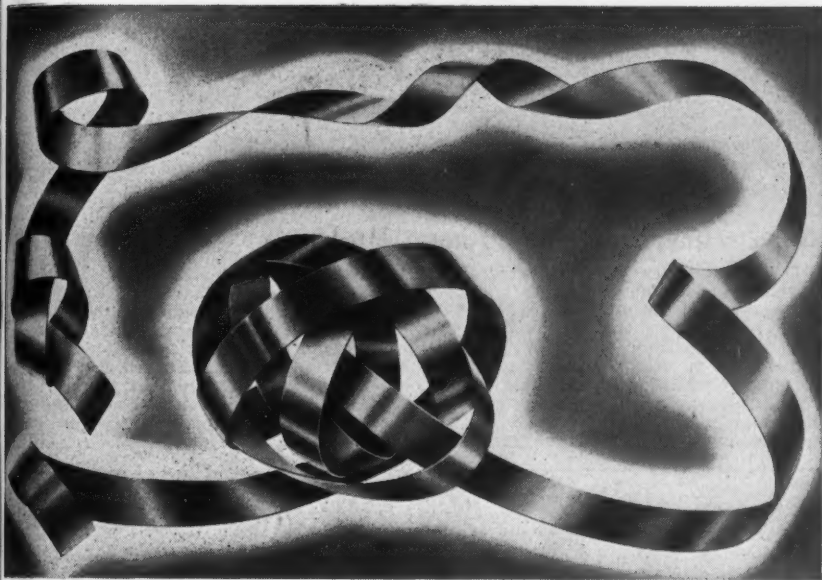
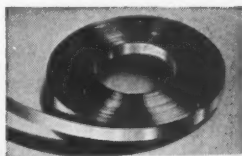
Any loose rust or loose scale on the surface is first removed by wire brushing. That portion of the scale which remains is a protection to the metal surface and aids in the retention of the paint. Wire brushing is followed by a treatment of the wire brushed surfaces with Synhibit, the inhibitor which dissolves and kills the remaining rust and prevents it from forming again. It not only kills surface rust, but also penetrates into the minute cracks in the scale and kills embedded rust so completely that it is impossible for it to grow under the surface of the scale or the protective covering.

In addition, Synhibit Inhibitor forms an ideal surface for the retention of Synhibit synthetic paints, and also insulates and prevents the formation of galvanic electric currents which would start corrosion and destroy the paint film.

The Inhibitor treatment is followed by the application of Synhibit primer which is a zinc chromate, iron oxide synthetic vehicle paint. Synhibit aluminum finish coat is recommended in most cases for the final coating.

Contortionist Duty

...FOR FLAT WIRE



THIS cold rolled high carbon steel flat wire is subjected to real beating in service. It's yanked around, coiled, tangled, bent.

Wire such as this must have an unusual combination of properties. Obviously it must be pliable but at the same time very strong. Extreme dimensional accuracy plus freedom from defects on the surfaces and edges are also required. And to complete the order, it must be of uniform

temper, held within very close limits.

For over 40 years our flat wire organization has been developed to turn out this custom-production work. From the steel refining in our own mills to the final rolling or polishing, every operation gets the same careful attention which is traditional at Roebling.

We invite your inquiry regarding any of the Flat Wires listed.



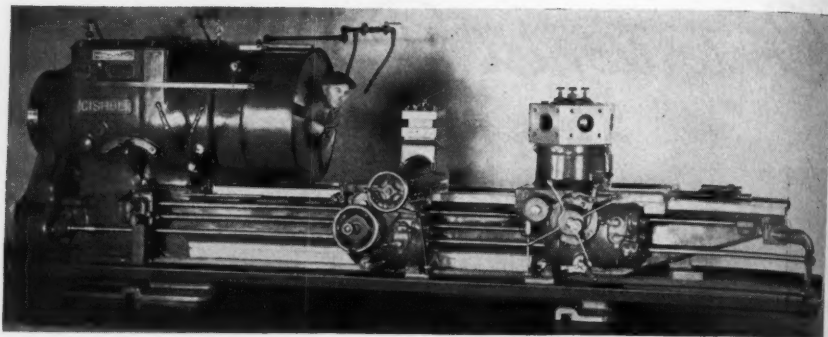
Roebling Cold Rolled Flat Wire is made from both high carbon and low carbon steels, produced in Roebling's own mills. The high carbon flat wire is available in tempered and untempered types.

Finishes:—bright, black annealed, bright annealed, tinned, japanned, galvanized, blued, straw-colored, coppered.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. Branches in Principal Cities

ROEBLING Cold Rolled Steel FLAT WIRE

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING



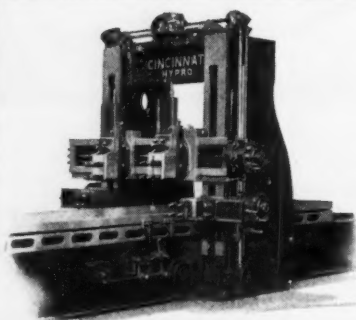
Gisholt Heavy Duty Turret Lathe

Gisholt Heavy Duty Turret Lathe

The Gisholt Heavy Duty Turret Lathe shown in the illustrations is one of a number of similar machines which were built recently by the Gisholt Machine Company, Madison, Wisconsin, for machining large steel forgings consisting of boring, turning, facing and tapping. The unusual requirements for these machines necessitated some departures from conventional designs. The lathe

has a spindle with 16½-in. unobstructed bore that is mounted on large anti-friction tapered roller bearings.

A Gisholt 34-in. three-jaw hydraulic chuck is used to hold the steel forgings. This chuck which is designed to suit a variety of work is operated by oil pressure from a separate hydraulic pumping unit. Another interesting feature is the standard lead screw used in feeding both cross slide carriage and hexagon turret carriage. This lead screw feed is of ad-



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CRANK PLANERS

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VERTICAL BORING MILLS

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DAVIS KEYSEATER

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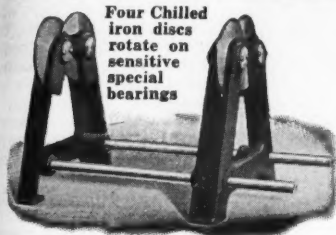
Anderson Improved Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and truing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

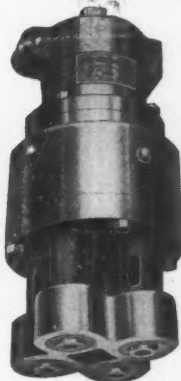


Four Chilled iron discs rotate on sensitive special bearings

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Made by **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

SPEED IN DRILLING

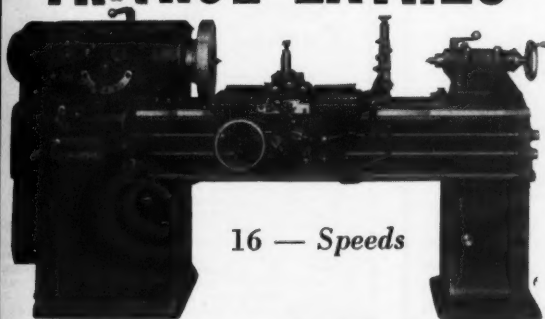
U. S. Multiple Drill Heads are made for drilling 4 to 50 holes at once. Thus, you get more holes per minute and larger profits. Our years of specialization in this work will save you money and assure an accurate, dependable and swift job. Send your blue prints for estimates.



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1954 Riverside Drive
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SIDNEY TRITROL LATHES



16 — Speeds

● FEATURES:

Timken Roller Bearings.
Multiple-Disc Driving Clutch.

Choice of three types of drives.

Adjustable Automatic Feed Release.

Sykes Continuous Tooth Herringbone Gears.

Lathe Bed has hardness of at least 190 Brinell.

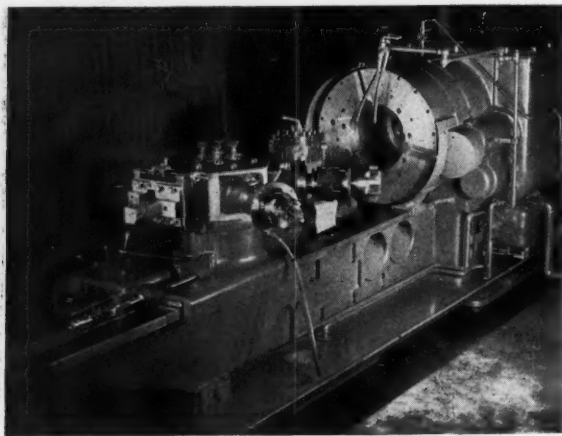
Write for complete details.

"Lathes and Milling Machines"

THE SIDNEY MACHINE TOOL CO.

210 HIGHLAND AVENUE

SIDNEY, OHIO



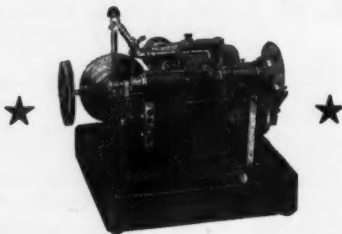
Rear View of Gisholt Heavy Duty Turret Lathe

vantage in leading the large collapsing taps into the work at the proper lead. Because of the amount of stock to be removed in cutting the thread, two taps are used, one for roughing and one for finishing the thread.

A coolant compound delivery device is used on the hexagon turret to deliver cutting compound to the various tools on each of the six turret faces. To thoroughly lubricate the anti-friction bearings on the spindle and other headstock bearings as well as gears and other parts, a special force feed oiling system is built into the machine. This system insures perfect lubrication and contributes greatly to the maintenance of accuracy of the spindle alignment by minimizing temperature changes in the spindle bearings.

In addition to these extraordinary features, there are those modern features regularly built into Gisholt Turret Lathes. Among these are hardened steel ways on the bed to assure long life and accuracy between bed and spindle alignment. The one-piece bed and headstock cast from a special semi-

"Waltham" Pinion Cutting Machines



Are made with a variety of equipments. They will make the two or three successive cuts needed for watch pinions or may be used for fine pitch gears up to 1½" diameter. There is also a 4" size. If you will describe your work we will send details.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

HIGH SPEED SHEARING

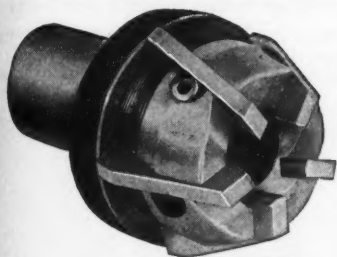
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Ring and Circle
Cutting

The ideal shear for sheet metal work—absolutely accurate and easily operated . . . metal is sheared and not punched . . . cut anywhere, no starting holes required for inside cutting . . . only one adjustment for various thicknesses of material used . . . material does not feed itself by action of the cutters . . . unobstructed cutting vision . . . no further finishing required. No special cutters, pilots, templates, or strippers are needed . . . long life shear blades. Standard equipment furnished for ring and circle cutting. Write for complete information.



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GREEN BAY, WISCONSIN
Manufacturers of shears since 1915

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Are Cutting Costs Everywhere

SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now.

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GENESEE MFG. CO., Inc.

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**Standardized
JIG BUSHINGS**
Acme Standard
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over 4200 items



Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

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PRECISION TAPPING MADE EASY

WITH THIS
**NEW
HIGH SPEED
TAPPER**



**SMALLER
LIGHTER
MORE
ACCURATE**

**easy to
operate**

WITH THE NEW
**“TRU-GRIP”
TAP HOLDER**

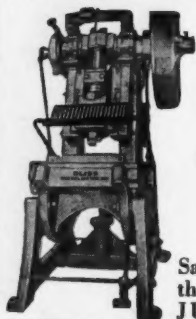
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Proconier Safety Chuck Co.
12 So. Clinton Chicago, Ill.

steel composition affords great strength and rigidity. All gears are hardened steel and the shafts are mounted on anti-friction bearings.

Power longitudinal rapid traverse to both carriages is advantageous for speed and ease of operation. Large longitudinal feed dials on both carriages provide visual observation of length of cuts. Adjustable longitudinal trip and stop roll for both hexagon turret and tool post carriage. Automatic spindle brake for stopping chuck quickly on completion of operation.

Junkin Safety Guards



ASSURE:

- Protection
- Increased Production

Safety is assured by the exclusive **JUNKIN TRIPLE INTERLOCK** which locks presses until guards are safe. For safety, economy and efficiency equip your presses with Junkin Safety Guards. Recommended for all type inclinable and small presses.

Write for facts and prices

Junkin Safety Appliance Co., Inc.
930 W. Hill St. Louisville, Ky.

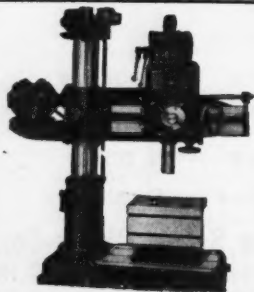
Van Keuren Gear Wire Set

The Van Keuren Company, 12 Copeland St., Watertown, Boston, Mass., has placed on the market a set of gear wires



Van Keuren Wire Set for Measuring Pitch Diameters of Involute Gears

which can be used for accurate measurement of the pitch diameter of either $14\frac{1}{2}$ deg. or 20 deg. involute gears of any number of teeth from 9 to 200. This new system of gear wires, which greatly simplifies calculations, is based on formulae given by Buckingham in his book "Spur Gears". The system involves the use of a series of wires which are inversely proportionate to the diametral pitch, tooth factors for each different numbers of teeth from 9 to 200, and values of $\cos 90/N$ for use in measuring gears with odd numbers of teeth. Complete formulae and tables showing how to make pitch diameter measurements are furnished with the wires.



MORRIS "MOR-SPEED" RADIAL DRILLS

FEATURE:

Rigidity—Convenience—Power—Simplicity—Low Cost.

Don't fail to investigate the "MOR-SPEED" line of Radials. Full facts on request.

THE MORRIS MACHINE TOOL CO.
CINCINNATI OHIO

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Made in
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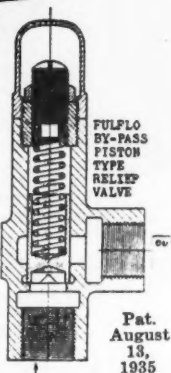
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OIL BY-PASS RELIEF VALVE

- Sturdy construction
- Proven performance and
- Accepted by leading valve users



Made in either bronze or cast iron with pipe sizes from $\frac{3}{4}$ " to $1\frac{1}{2}$ ".

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Checking the Work on Small Machines

Productimeter 5D1 is the counter for bench millers, small lathes, drill presses, etc.

Save cost of hand counting with Productimeters on all production machines.

Productimeters

THE SPEEDOMETERS OF INDUSTRY

DURANT MFG. CO.

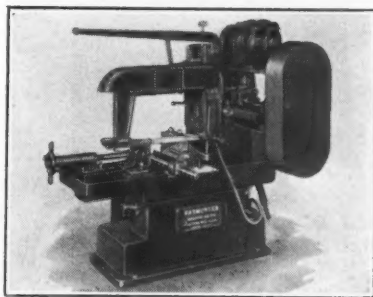
1932 N. Buffum St. 173 Eddy St.
Milwaukee, Wis. Providence, R. I.

TELL US WHAT YOU WANT TO COUNT

THE NEWEST DEVELOPMENT IN METAL SAWING MACHINES

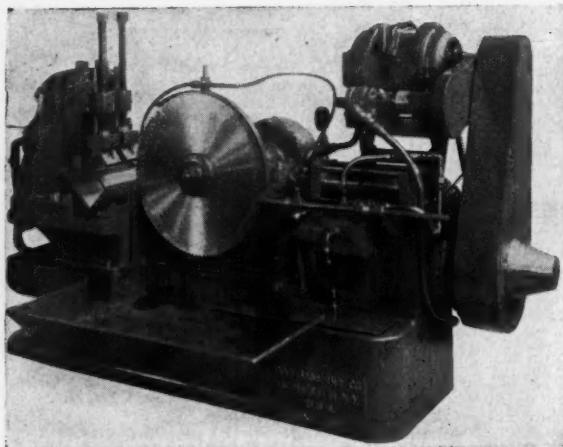
CAPACITY 10" x 10"

Swivels on base for angular cuts—three speeds by V-belt—saw guide of parallel type—saw frame has 4 large, self-aligning shoes, unaffected by excessive tightening of saw blade—vise graduated to 45°—feed is compensating type.



Also built as FULL AUTOMATIC.
Send for circulars giving complete information.

RASMUSSEN MACHINE CO. RACINE, WIS.



Cochrane-Bly Hydraulic Cold Saw

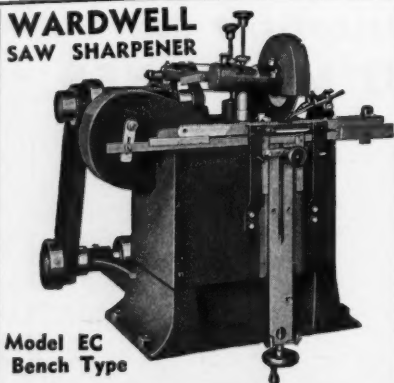
Cochrane-Bly Hydraulic Cold Saw

For the rapid cutting of non-ferrous tubing and bars, The Cochrane-Bly Co., Rochester, New York, has recently brought out a new High Speed Machine,

having a four speed sliding gear transmission through hardened alloy steel gears, hardened steel worm, and phosphorus bronze worm gear, running in oil, and all drive shafts including the saw spindle mounted in anti-friction bearings.

Remote control is provided for changing the saw speeds from 235 to 600 feet of cutting speed per minute, and the hydraulic feed is adjustable from 0 to 60 in. per minute. Machine has automatic trip and rapid return of carriage, and rapid forward traverse of carriage. Adjustable stops regulate the travel of carriage to the size of tube being cut. Machine has hydraulically operated

vise with compound toggle link and vertical slide carrying adjustable clamp screws each side of saw blade. These screws are fitted with removable Vee or radius blocks to prevent distortion of

**WARDWELL
SAW SHARPENER**Model EC
Bench Type**Automatically Sharpens Hack,
Band & Circular Saws**

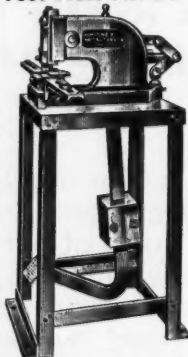
with teeth as fine as 32 to the inch,
at a speed of 30 to 75 per minute.

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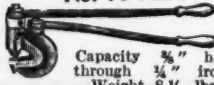
THE WARDWELL MFG. CO.

3166 FULTON RD.

CLEVELAND, O.

Foot Press No. 28

Capacity 2" hole in 16
gauge — 100 holes per
minute.

No. 10 Punch

Capacity $\frac{3}{4}$ " hole
through $\frac{1}{4}$ " iron.
Weight 8 $\frac{1}{2}$ lbs.

**Angle
Iron
Shear
No. 4**

Capacity
2x2x $\frac{1}{4}$ "
Angle Iron.
Weight
44 lbs.

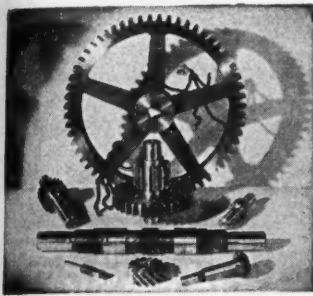
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**80 ITEMS
FROM WHICH
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WHITNEY METAL TOOL CO.

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"THEY LIVE ON THE JOB"

Mass.  Gears

Have the qualities which you expect in your gearing.

All Types and Materials.

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27 Nashua St. Woburn, Mass.

Remove Broken Taps!

Easily—
Quickly—
Without Injury
To the Threads



The Walton Tap Extractor is a device for removing taps broken at or below the surface of the work—easily—quickly—and without injury to the threads.

Made in 2, 3, and 4 fluted styles in all standard sizes from No. 4 to 1 1/2 inch. Let us prove its value to you by a 60-day free trial.

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We appreciate the fact that your Materials Handling Problem* is distinctly different from that of your neighbor across the street.

In fact, that's the reason why we build 98 different standard LO-HED hoists. This wide range of capacities, speeds and types of hoists makes the odds 98 to 1 that a standard LO-HED will handle your material. And buying a standard hoist saves money.

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thin walled tubing under clamping pressure.

An extended pan provides large storage space for chips and permits easy access of shovel for their removal.

Tank for hydraulic oil is located under the base of machine, and base provides a sump for drainage of cutting oil.

Machine is motor driven through multiple Vee belts, and has friction clutch for instant stopping and starting.

Machine has capacity for tubes up to 8-in. diameter and in eight seconds cut-

ting time. The weight of the machine is approximately 5000 pounds.

New Hannifin 75-Ton Sensitive Straightening Press

A Hannifin hydraulic press of 75-ton capacity, especially designed for straightening operations on airplane propellers and similar work requiring accurate straightening has been developed by Hannifin Manufacturing Company, 631 South Kolmar Avenue, Chicago, Ill. With the exception of table and cylinder this press is built of welded plates and shapes. The exceptionally fine appearance of the press is further enhanced by the complete absence of exterior piping.

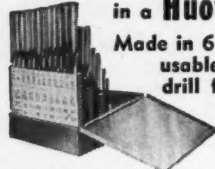
Simplified handling of straightening operations and increased production are features resulting from the exclusive design of the control mechanism of this press. A single lever controls the entire operation of the ram, with an extremely sensitive proportional control action. When the control lever is moved in either direction, the ram will move a proportional distance and then stop, and simultaneously the operating valve shifts to neutral.

When in neutral, the pump idles at zero pressure. Thus the operator, merely by moving the one operating lever, obtains a ram movement at 75 tons pressure through the exact distance required for the straightening of any piece. Very slight and accurate ram movements, either up or down, may be obtained. The arc of movement of the control lever is several times the ram stroke, providing for very sensitive handling without requiring the development of special skill on the part of the operator.

The hydraulic power unit, with constant delivery type rotary pump, is built into the base of the press, making a

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Made in 6 sizes. The most usable and efficient drill filing system obtainable.

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Double capacity over ordinary machine vises. One piece hand wheel and nut—extra long thread. Hardened tool steel jaws, reversible for V-groove or plain surface. Write for circular. Jaws 6 3/4" wide . . . 2 1/2" deep . . . open 6 3/4".

J. E. MARTIN TOOL & DIE WKS.
Springfield, Ohio

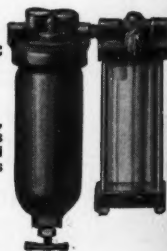
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"Super" Speed Air Grinder An Outstanding Performer

The ONLY Hand Grinder with Spindle Speed of 100,000 R.P.M. Operates on Air Pressures of 45-100 pounds. Weighs 8 1/2 ounces.

Combined Automatic Lubricator and Air Line Filter

Delivers Absolutely Clean, Lubricated Air to Bearings of Any Tools, Operated Off Air Lines. Eliminates Costly Shut Downs.



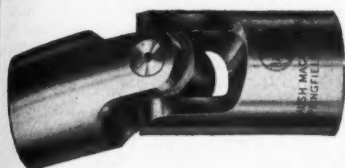
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M-B PRODUCTS

130 E. LARNED ST., DETROIT, MICH.



BAUSH..



UNIVERSAL JOINT

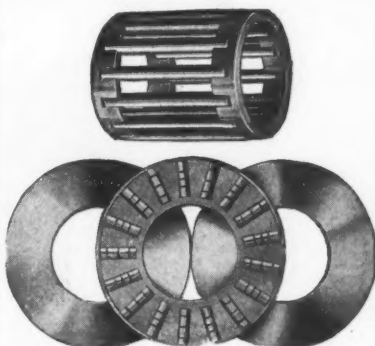
Baush Universal Joints have been on the market for years, but we have made improvements both in materials used and in construction. Consists of five pieces only and can be easily taken apart and reassembled. From $\frac{5}{8}$ " to 4" dia., in steel or bronze or steel with bronze center blocks. Maximum angle 36 deg.

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BAUSH MACHINE TOOL CO.

SPRINGFIELD, MASS.

U. S. A.



**BALL THRUST BEARINGS
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JOURNAL ROLLER BEARINGS**

Special Bearings Made to Order.
Send Sketch or Sample for Quotation.

Catalog Upon Request

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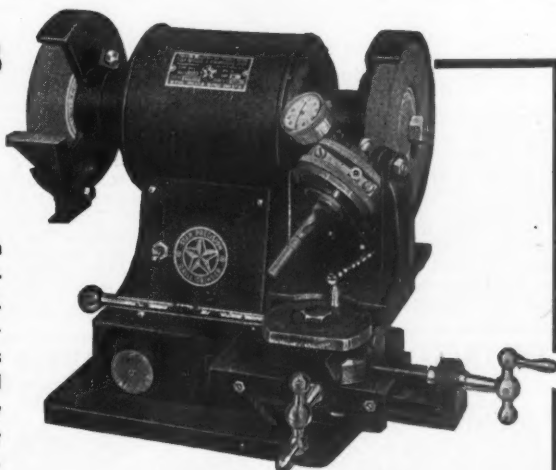
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81 SIZES OF Drills

No. 31 to $\frac{1}{2}$ "

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



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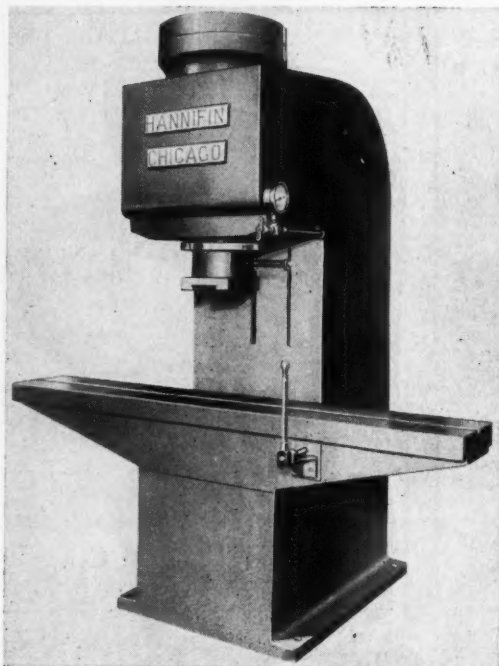
STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

BLOOMFIELD AVE.

BLOOMFIELD

NEW JERSEY



Hannifin 75-Ton Sensitive Straightening Press

self-contained unit that requires the minimum of floor space. No separate hydraulic power is required, and piping is entirely within the press frame, simplifying the installation and making operation unusually economical.

The ram delivers 75 tons pressure, and may be fitted with any type of fixture required for handling the parts to be straightened. The ram stroke is 12 inches. Speeds are: power stroke 24

inches per minute—return stroke 40 inches per minute. Dimensions are: table to ram (up) 18 inches, center of ram to face of frame 10 inches, length of table 84 inches, floor to table 36 inches, overall height 100 inches. Base 32-52 inches.

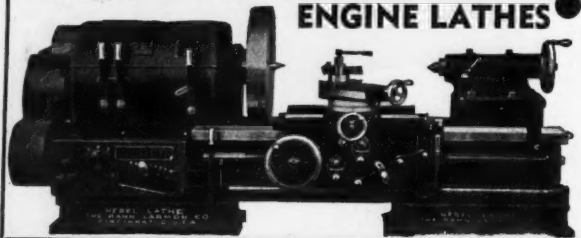
Hannifin "Hy-Power" Portable Hydraulic Press for High Speed Pressing Operations

Hannifin Manufacturing Company, 631 South Kolmar Avenue, Chicago, Ill., has developed a high speed portable hydraulic press for the application of timing gears and harmonic balancer units to automobile engine crank shafts. The press is fitted with a locating fixture which simplifies handling and alignment of the press with the work and assures starting the parts squarely on the shaft when being pressed into position.

The portable yoke-type press weighs approximately 80 lbs. and is controlled by a push button in the handle. Hydraulic power is provided by a Hannifin "Hy-Power" hydraulic pressure generator which is a complete and self-contained unit driven by a 2 h.p. motor. High pressure hoses and a control cable connect the "Hy-Power" generator and the portable press.

The high speed operating cycle is completed automatically upon pressing the control button which actuates the automatic electric valve unit. The operating cycle includes: (1) rapid advance stroke at moderate pressure, (2) high

GEARED HEAD & CONE DRIVEN ENGINE LATHES



Sizes
16" to 36"
Swing

A full line of Gap Lathes,
16" to 50" swing.

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Information.

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CINCINNATI, OHIO

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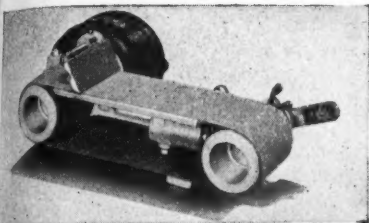
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March, 1937

MODERN MACHINE SHOP 219



• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.

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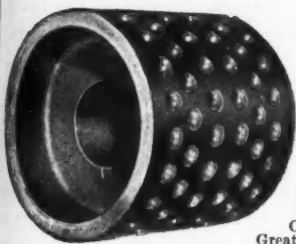
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WALLS SALES CORP.

96 WARREN ST.

NEW YORK, N. Y.

STOP BELT SLIPPING!



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Great Britain

VACUUM CUP METAL PULLEYS

Guaranteed to: Eliminate belt slippage and power loss . . . increase life of belts and equipment . . . wear indefinitely . . . keep belts from flying off. Belt is sealed to pulley at vacuum contacts.

Order now on 30 DAY FREE TRIAL OFFER. Used in many of the largest plants.

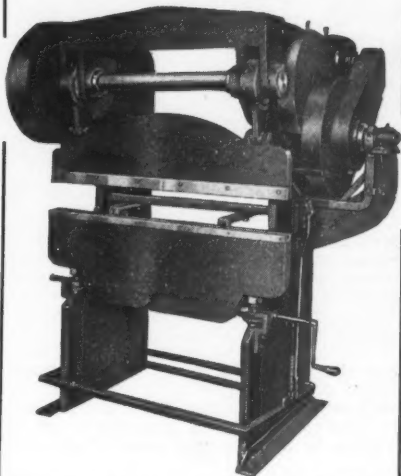
Vacuum Cup Metal Pulley Co., Inc.

1010 Ford Bldg.

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No. 253



**Does 40% to 60% of the
forming work turned out
by the average shop.**

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

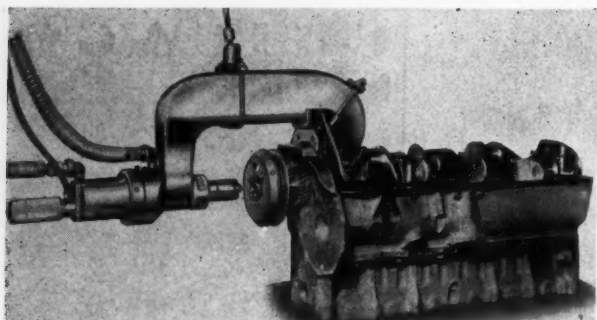
Write for Circular No. 253

**DREIS & KRUMP MFG.
COMPANY**

7418 LOOMIS BLVD.

CHICAGO

ILLINOIS



Hannifin "Hy-Power" Portable Hydraulic Press

pressure for the pressing stroke, (3) reversal at peak pressure, and (4) rapid return to starting position. The pump idles at zero pressure between cycles. The complete operating cycle requires approximately 2 seconds.

The high speed automatic operation and the ease of handling pressing operations of this type with the required accuracy make this Hannifin portable press equipment an important contribution to modern manufacturing meth-

The lathe is of most modern design, correctly built, substantial, powerful and easily operated. All parts are jig machined and are fitted to templates; thus interchangeability of parts and accuracy are assured. The lathe has a swing of 12 in. over the bed or 9½ in. over the carriage, and will turn 36 in. long between centers on a bed 60 in. long.

The belt driven headstock is 12¼ in. long and 10½ in. wide. Bearings on the belt driven lathe are fitted with adjust-

ods. Similar presses may be adapted to a variety of other press assembly operations.

Oliver 12-In. Speed Lathe

A precision speed lathe designed to meet the demand for such a machine for finishing, accuracy and general utility in the machine shop has been placed on the market by Oliver Machinery Company, Grand Rapids, Mich.



RIVETING?

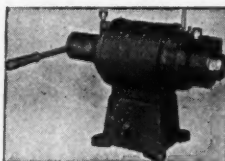
LINLEY NOISELESS ROTARY RIVETING MACHINES

Assure Peak Production and Lower Maintenance, Rigid and Powerful, Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

LINLEY BROTHERS CO.
583 Fairfield Avenue
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IDEAL SPEED LATHES



FOR LAPPING FINISHING POLISHING SMALL PARTS

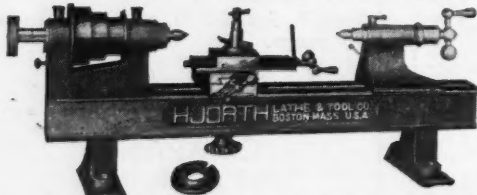
2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Cir. 351.

SCHAUER MACHINE CO.

905-7 Broadway

Cincinnati, Ohio

... for more than 1001 odd jobs



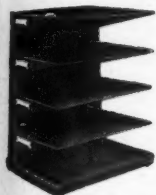
The HJorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the HJorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

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**SAVES
TIME
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ROUTES**

... the papers of your daily work. Saves shuffling and reshuffling papers many times a day. Can be useful on every desk. Order today.

No. 104 Letter Size \$5.00

Sold on money back guarantee.

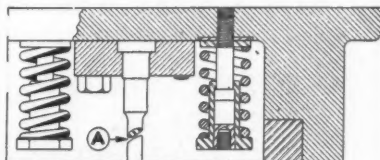
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16 Terminal

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The most dependable and economical stripping device made.



PATENTED

A—Broken punches may be replaced without delay.

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C—No stripper plate required for stripping scrap—strippits alone will strip it.

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THE STRIPPIT CORPORATION

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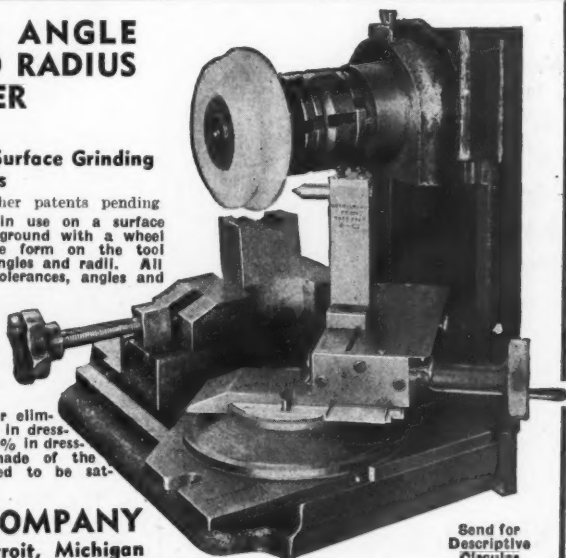
Also Wales Adjustable Hole Punching Dies

THE VINCO ANGLE TANGENT RADIUS DRESSER

for

Internal, External and Surface Grinding Machines

Patented June 5, 1934. Other patents pending. This shows a Vinco Dresser in use on a surface grinder and also a form tool ground with a wheel formed with this dresser. The form on the tool consists of straight surfaces, angles and radii. All dimensions are held to close tolerances, angles and radii must be tangent. It is easy to dress forms like this on abrasive wheels, for the Vinco Dresser has the patented basic feature of dressing angles and radii from the same axis without moving the diamond, angles and radii are always accurate and tangent. The Vinco Dresser eliminates all worry and uncertainty in dressing angles and radii and saves 75% in dressing costs. It is precision made of the finest materials and guaranteed to be satisfactory.



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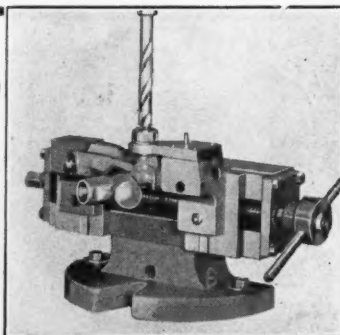
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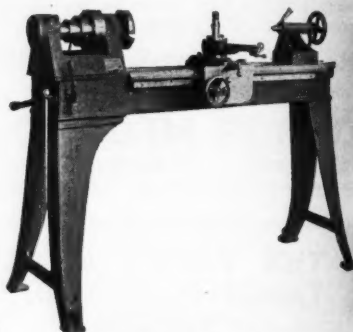
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able split bronze bushings grooved inside for oil passage, and ring-rolling from ample oil wells having both level and drain plugs. Ball bearings are used on motor headstock. End thrust is provided for by having the ends of the cone pulley press against the bronze bushings. The cone can be expanded to provide adjustment.

The spindle is 15 in. long, $1\frac{1}{2}$ -in. diameter at the front bearing and $1\frac{3}{4}$ -in. diameter in the rear bearing with a $\frac{5}{8}$ -in. hole its entire length. It is bored for a No. 2 Morse taper. The spindle has Parsons white bronze ring-rolling bearings (3 in. long) which are adjustable for wear.

The cone has four steps of $6\frac{1}{2}$ -in., 4-15/16-in., 4-1/16-in., and $3\frac{3}{8}$ -in. diameter with a $1\frac{3}{4}$ -in. face, giving 700



Oliver 12-In. Speed Lathe

1195, 1920, and 2800 r.p.m. The pulley cannot come loose on the spindle. A $1\frac{1}{2}$ -in. belt is used.

The bed is a cored casting $6\frac{1}{4}$ in. deep, $6\frac{3}{4}$ in. wide and regularly 16 in. long. The top is planed flat with the inside edges machined to act as ways for the alignment of the headstock and tailstock. The lathe is regularly furnished with a hand feeding carriage and compound swivel rest but these may be omitted if desired. The ways for the carriage are cast to the side of the bed. Two iron brackets are fastened on the back to support a tool rack. The lathe is furnished with floor legs which bring the top of the bed 36 in. from the floor.

The four-step cone pulley for countershaft belt drive and the tight and loose pulleys are supported by the shaft in ring-rolling hangers. The loose pulley has a well lubricated bronze sleeve run-

March, 1937



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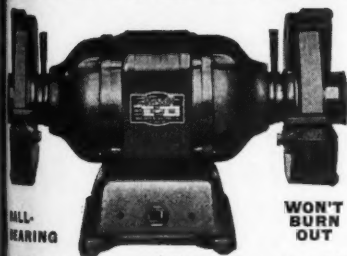
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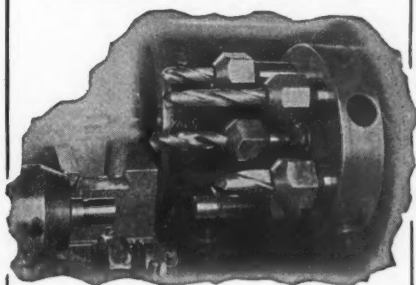
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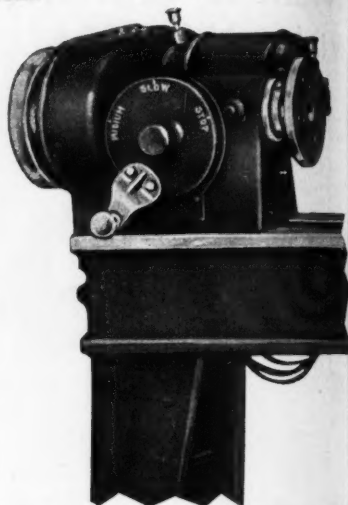
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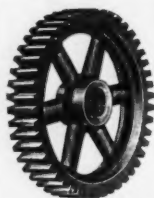
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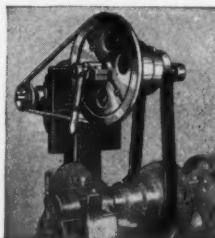
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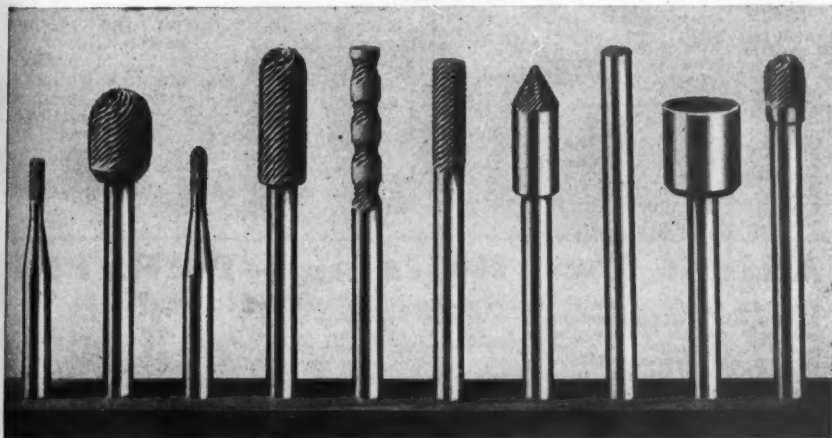
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Fig. 1—Michigan Combined Involute and Tooth Spacing Checker

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The sine bar on these machines acts as a compensator for the differences between the lengths of arc on the friction disc, which originates the machine movements on the base circle of the gear being checked. Fig. 1 shows a general view of the machine while Fig. 2 shows a close-up view for combined reading of tooth spacing and tooth form.

The friction disc is integral with the work holding spindle and imparts movement to the sine bar carriage. The angular setting of the sine bar controls

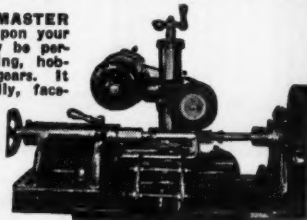
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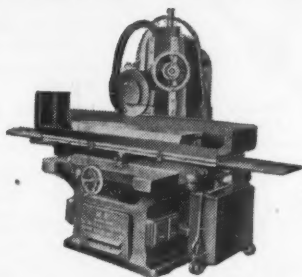
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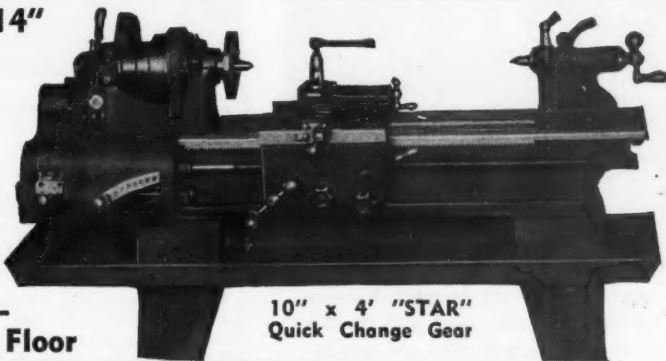
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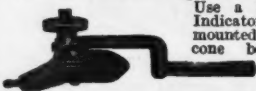


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the movement of the indicator head, which is counterweighted to hold it against the sine bar as shown in Fig. 1. The smaller the gear being checked, the smaller the angular setting of the sine bar. Each degree of work rotation may be read on a scale alongside the sine bar carriage.

The use of two indicators and a reversible finger for tooth form makes possible the reading of tooth form on



Fig. 2—View showing reading of tooth spacing and tooth form.

front and back faces in the same set-up. Eliminating the usual dismounting or reversing of the gear for this purpose, of course, makes for more consistent checking. Capacity of gears which may be checked on this machine is 12 in. diameter by 12 in. in length.

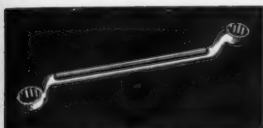
On the Michigan Spiral Lead Checker shown in Fig. 3 the spiral lead is checked in preference to the helix angle for the reason that the lead is constant no matter at what depth or portion of the tooth the measurement is taken while the specified helix angle is only correct at one diameter and varies with the depth at which the measurement is taken.

The Michigan Spiral Lead Checker takes gears up to 16 in. diameter with leads of 6 in. or over for either right or left hand spirals. On the machine the sine bar is set to correspond to the correct spiral lead by means of two



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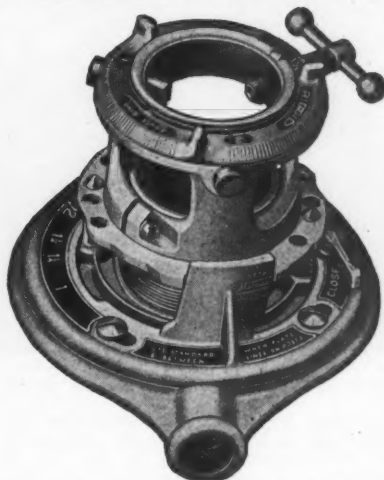


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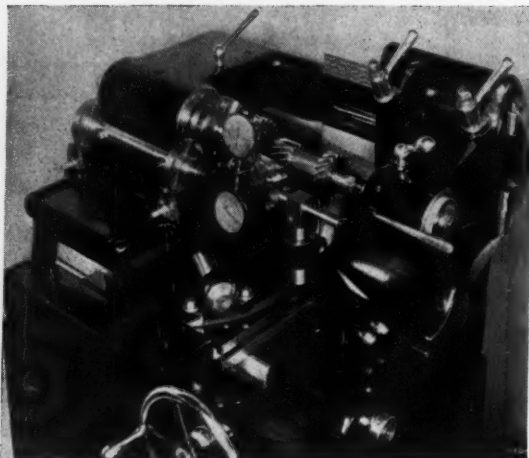


Fig. 3—Michigan Spiral Lead Checker set up for operation.

measuring buttons. The sine bar carriage and the indicator are moved by the hand wheel parallel to the axis of the gear. A clevis straddling the sine bar moves the upper carriage at right angles to the sine bar carriage. The

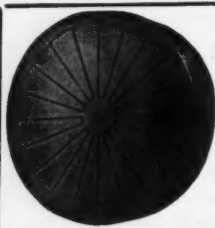
work holding spindle is revolved due to friction of two lapped blocks on rolls. In this way indicator movement and gear rotation are synchronized during checking. When the indicator is in contact with the gear tooth, any variation from the proper lead is shown on the indicator.

Super Speed Punch Press—Error

In the announcement of the Super Speed Punch Press on page 188 of the January issue of MODERN MACHINE SHOP, the statement was made that the machine works at speeds as high as 350 strokes per minute. Actually, the machine operates at speeds as high as 1000 strokes per minute.

Explosion Proof Motor Starters

Westinghouse explosion proof manual motor starters, now being marketed by Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., are particularly adapted



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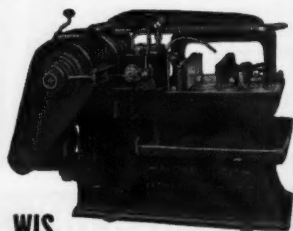
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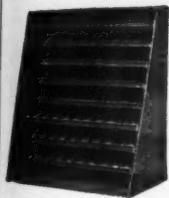
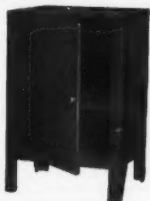
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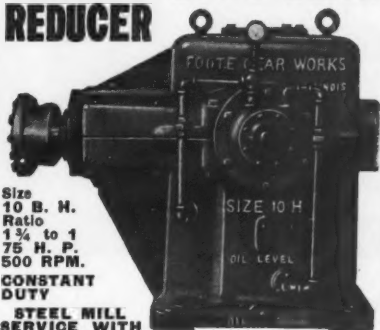
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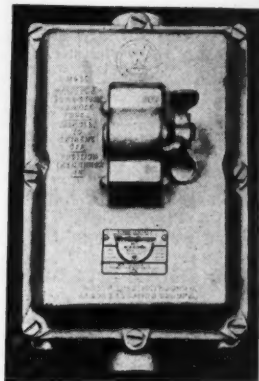
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QUALITY

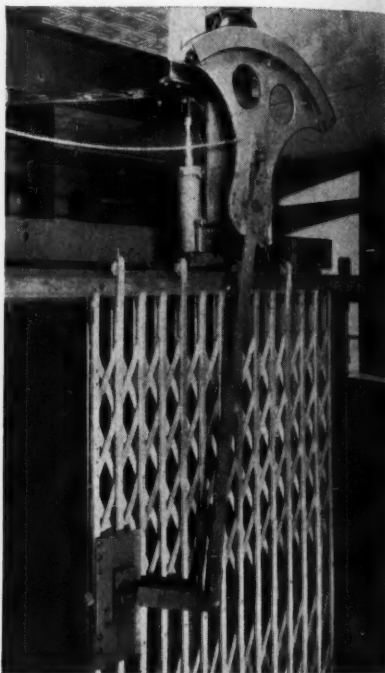
*Special Cutters made to
Blue Prints*

**QUALITY
TOOL WORKS**

Waukegan, Illinois

Automatic Electrically Controlled Gate-Operating Mechanism

The illustration shows an automatic electrically controlled gate-operating



Automatic Electrically Controlled Gate-Operating Mechanism

mechanism which is available through the Ohio Electric & Mfg. Co., Cleveland, Ohio. This mechanism is said to permit

QUICK-LOADING STOCK REELS

SINGLE AND DOUBLE

For use with automatic machines and punch presses with feeds. Also reels for wire.



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S & S MACHINE WORKS

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\$2**

A sturdy reliable or drill —Depth —and parable or 6 1/2"

L-W

**NIC
EXPA**



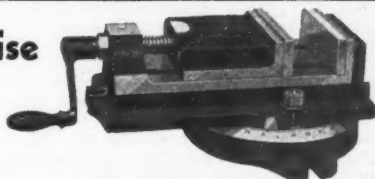
W. H.

GR



**TH
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**NEW 4½" JUNIOR
L-W Milling Machine Vise**
\$2150 Most outstanding value
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A sturdy, dependable vise suitable for milling machine or drill press—Jaws open 3"—Depth of jaws 1¾". Hardened and ground jaws. Comparable in every respect to our 6½" Vise.

*Semi Steel
Casting
50 lbs.
Boxed*

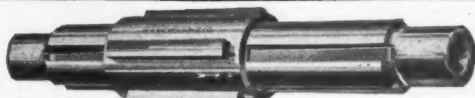
*Also Magnetic Chucks, Lathe Chucks,
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**NICHOLSON
EXPANDING MANDRELS**



They act as internal chucks for holding work while being machined on lathes, millers, grinders or shapers. Made in 14 different sizes, taking bores of every fractional part of an inch from ½" to 7". Sold either singly or in sets. Bulletin 530.

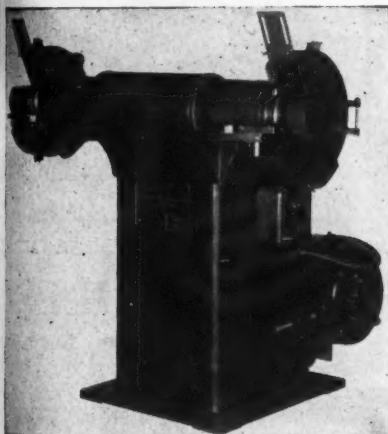


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● An unusually complete line from ½ to 20 HP. Bench, Pedestal, Standard & Special Widths, Combination Grinders & Buffers, Disc Grinders, Normal or Heavy Duty.

Built in "Motor in Head" or Selective Speed Designs. Self Contained Exhausters available.

A line designed to allow you to select the least investment for each application.

We also manufacture a complete line for the motorization of cone pulley machines.

Quotations submitted promptly.

THE PRODUCTION EQUIPMENT CO.

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CLEVELAND, OHIO

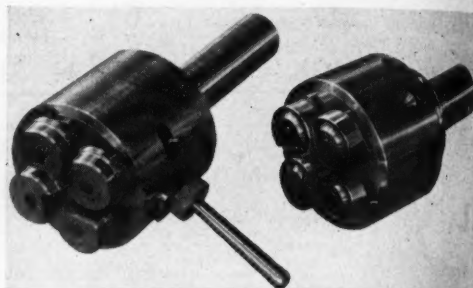
faster and more positive gate operation than the usual gate opening and closing devices. As can be seen from the illustration, the regular opening and closing lever is attached to a quadrant driven by a special type electric motor which is so designed as to permit it to be stalled in the circuit at the end of the travel without taking more than approximately full load current and without overheating. This is known as a "torque motor" and is, of course, adaptable to many other uses besides the one described here.

The torque motor makes it possible to obtain the positive holding effect of a solenoid combined with the much greater range of travel and lower cost of the motor. In operation, the motor is switched on by means of the usual gate control mechanism until the gate reaches the end of its travel. The motor is then stalled at full torque until the next movement of the cage or car, which reverses it to close the gate. The simplification of the motor wiring and switch gear is another important point, and it is stated by the

manufacturer that "torque" motors can be built for any on-and-off cycle up to being stalled for 24 hours at a time without injury.

Namco Hollow End Milling Tool

The hollow end milling tool shown in the illustration has been added to the



Namco Hollow End Milling Tool

line of opening dies, collapsing taps and other turret lathe and screw machine tools made by The National Acme Com-

PRECISION BORING

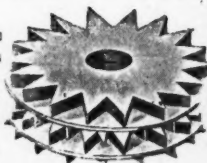


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Dressers
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URBANA, OHIO

THESE SWISS PATTERN FILES



Over 2000 Regular Shapes, Cuts and Sizes.

Always Make Good In
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ELIZABETH, N. J.

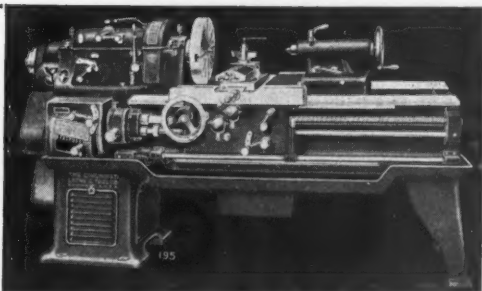
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Improve precision. Supply them in 14", 16", 18" and 20" sizes complete with gear, pump, taper, and draw-in attachments.

SPECIALISTS OVER 30 YEARS

Immaculate units are subject to rapid wear. The refinements of design and careful workmanship in these lathes give the lasting accuracy so necessary for those that desire to produce the best work in the least time. Latest catalog sent upon request.

Cincinnati Lathe & Tool Co.
Oakley, Cincinnati, Ohio



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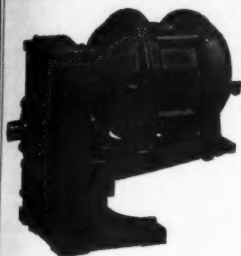
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Motors From $\frac{1}{8}$ to 15 H. P.

Send for Catalog

Cullman Wheel Company

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Rugged construction, substantial long-lived blades, and easy adjustment distinguish the Type No. 7 Wetmore Adjustable Shell Reamer . . . another of the famous line of Wetmore Reamers, built to Wetmore precision standards. Write for Catalog No. 36.



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Designers and tool engineers are invited to avail themselves of our consulting service on all reaming operations—standard or special tools to decrease your manufacturing costs.

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All Kinds Any Quantity

At the Right Price

THE CINCINNATI GEAR CO.
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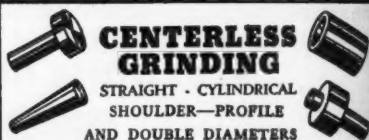
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The new EVER-SHARP DIAMOND TOOL is made with a long, natural shaped diamond—requires no resetting—is adapted to ALL types of wheel dressing operations—economical—accurate.

WHEEL TRUEING TOOL CO., INC.
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pany, 172 East 131st St., Cleveland, Ohio. The tool is designed to use circular cutters with the same micrometric adjustment and positive locking feature as is used in holding circular chasers. By using more than one step on the cutters, it is possible to turn several diameters with one pass. After the tool has completed the cut, the cutters are automatically released and backed off, without marring the work.

Provision is made for adjustment of diameter. The cutters are sharpened much the same as ordinary cutters, but are set after sharpening by means of a micrometer gage to insure even distribution of the cut. This method of hollow milling enables the operator to resume work with a minimum of down time. Cutters may also be used for facing or turning a radius on a shoulder if desired. The tool holder may also be used as a standard self-opening automatic die head by simply changing from hollow milling cutters to circular chasers. Thus either milling cutters, circular chasers, or a combination of both may be used in these tool heads. Diameters from 0.056 to 13 3/4 in. may be end-turned in this manner with standard cutters.



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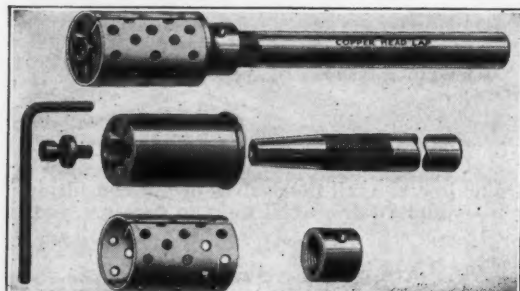
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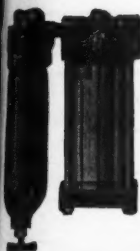
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2120 Walnut Street, Chicago, Ill.

M-B Automatic Air Line Lubricator and Filter



For the benefit of those of our readers who may have obtained an erroneous impression of the design of the Automatic Air Line Lubricator and Filter made by M-B Products, 130 E. Larned St., Detroit, Mich., as a result of the illustration being printed upside down

pictures give readers an abbreviated but highly interesting tour of this modern, up to date, transmission belt factory.

Complete information pertinent to the installation or describing the process pictured is contained on the back of each picture. Copy free upon request.

Holo-Krome Fibro Forged Socket Screws are described and illustrated in a two-color catalog containing 38 pages, $8\frac{1}{2} \times 10\frac{1}{2}$ in. The book also contains a variety of tables, specifications, data, Standards, illustrations and interesting news for the users of socket screws. Copy of the catalog can be had by addressing Holo-Krome Screw Corporation, Hartford, Connecticut.

in the announcement of this filter which appeared on page 173 of the January issue of MODERN MACHINE SHOP, the illustration is reproduced here with in the correct position.

An Album of Familiar Belts, a folder containing twenty-five reproductions of photographs taken in the field and in the factory has been released by United States Rubber Products, Inc., 1790 Broadway, New York City.

These pictures show interesting and unusual installations of Transmission Belts in a variety of industries, as well as a number of exceptional studies made by Margaret Bourke-White, chief photographer for Life, the new picture magazine, at U. S. Rubber's Passaic Laboratories and Factory. The latter

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This Famous Micrometer Type Boring Bar

will introduce new standards of efficiency and economy in your plant. Operation at *maximum* efficiency is assured by quick, accurate Micrometer Adjustment of cutters for size.

Made in multiples for line boring, this accurate tool is designed for successful use on any rough, semi-finish and finish boring operations.

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"There's One in Every Shop"

By Wesser



Standard Sling Chain Specifications. Men who are responsible for the purchase and maintenance of chain for lifting purposes will be interested in a new edition of the booklet, **Standard Sling Chain Specifications**, issued by American Chain Division of American Chain & Cable Company, Inc., Bridgeport, Conn.

In addition to "Definitions, Cautions

and Instructions Governing the Purchase and Use of Chain" issued by The Chain Institute, it shows dimensional illustrations and specifications for single, double and multiple leg sling chains; a table of safe working loads for iron sling chains; specifications for Ajax and H. B. Grades Dredge or Iron Crane Chain. Copy free upon request.

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